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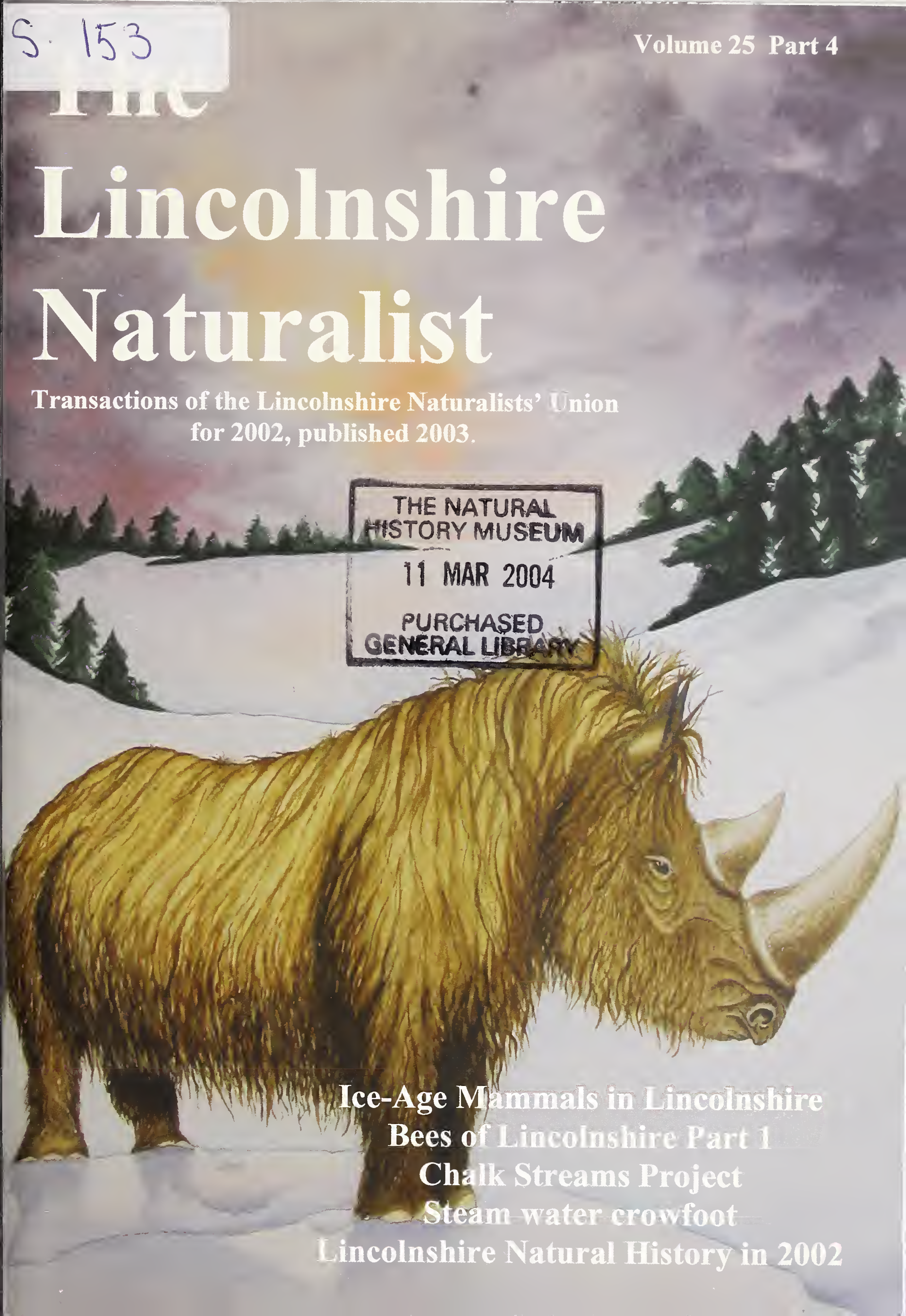

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THE LATE PLEISTOCENE MAMMAL FAUNA OF LINCOLNSHIRE

Neil Pike

"creatures that were left over from the time when the Creator hadn't really decided what He wanted to make and was, as it were, just idly messing around with the Pleistocene"

Terry Patchett: Equal Rites

INTRODUCTION

Lincolnshire is a county with nationally important resources of sand and gravel. This in itself is perhaps only of interest to the aggregate companies and the residents local to where these reserves are found, but further exploration of these sites reveals evidence of a Lincolnshire very different to the one we know today, and not that far into the past. Palaeoecologists are well aware of the importance of sand and gravel deposits in the process of piecing together the environment of Lincolnshire during the Ice Age and each new site or find helps to improve our understanding of what our county was like tens to hundreds of thousands of years ago.

The purpose of this paper is to introduce readers to some of the animals that were once part of Lincolnshire's fauna. I will explain a little about the environment in which they lived and what evidence has helped us to reach these conclusions. It should be remembered, however, that

The outwash gravels at edge of the Wolds might have looked like these in present-day Iceland

photo N Pike

much of what will be described is still the subject of controversy among quaternary specialists and palaeoecologists. Much of what we know about the environment during the Ice Age is not set in stone, (if you'll excuse the pun), but subject to a number of possible interpretations and there is still much we do not know. My intentions are to present a guide to what we think might be the case for those readers who are not geologists (myself included!).

Before all this, however, we must examine the processes that led to the laying down of the sands and gravels that are so crucial to our knowledge of Pleistocene Lincolnshire. This will also help to give us an understanding of the Ice Age 'timeline' and the context in which these deposits were laid down.

Warm Ipswich, Cold Beeston – know your glacials from your interglacials

Let us not use the term Ice Age. It suggests a period of continual cold and ice, which is not the case. The period commonly known as the Ice Age is more correctly termed the Pleistocene period. It began somewhere between 1.2 and 1.8 million years before present (b.p.), and even this basic fact is debated. It ended around 10,000 b.p. with the end of the Loch Lomond ice advance, and we moved into our current geological time period, the Holocene.

1.8 million years is a long cold snap, but further investigation of the evidence reveals that the period was not continually cold – there were very wide fluctuations in temperature during the Pleistocene that caused complete changes in the natural environment in the county. This is why the term 'Ice Age' is something of a misnomer – parts of the Pleistocene were as warm, if not slightly warmer, than the climate we enjoy today. In fact the Pleistocene can be sub-divided into periods of warm and cold conditions – or glacials (cold) and interglacials (warm). To further complicate matters, each glacial period was subject to narrower temperature fluctuations when environmental conditions were slightly less severe – these are called 'interstadials'. Each warmer Interglacial was also subject to periods where the temperature dropped, but not enough to trigger a new ice advance – these are known as 'stadials'. There is environmental evidence of these changes of temperature and the related change in environmental conditions – although the further back into the Pleistocene you wish to examine, the more difficult to interpret that evidence is.

Each glacial, interglacial, stadial and interstadial has a name, usually given to it by the 'type-site'. These are places where the first or most compelling evidence of the environmental conditions from this particular period can be found. Thus the residents of Ipswich, Cromer, Beeston and Hoxney can be satisfied that the names of their towns will live on forever. The start and end dates of these periods are still controversial, particularly as you travel back to the earliest ones, and there is still discussion about the environmental nature of some of the periods – but the basic structure of glacial and interglacial periods can be summerised thus:

Period	**Approx date (before present)**	**Hot or Cold?**
Baventian		Cold (Glacial?)
Pastonian		Warm (Interglacial)
Beestonian		Cold (Glacial)
Cromerian	700,000 - 500,000	Warm (Interglacial)
Anglian	500,000 - 400,000	Cold (Glacial)
?	400,000 - 330,000	Cold (no glaciation?)
Hoxnian	330,000 - 297,000	Warm (Interglacial)

Wolstonian	297,000 - 135,000	Cold (Glacial?)
Ipswichian	135,000 - 70,000	Warm (Interglacial)
Devensian	70,000 - 10,000	Cold (Glacial)
Holocene (Flandrian)	10,000 – present	Warm (Interglacial?)

As is clear from the above, there are still some uncertainties about the succession of ice advances and retreats – complicated by the controversy about the limits of ice advance (indeed, even the presence of glaciers) during cold periods. This is particularly the case in Lincolnshire, as evidence of glaciation during the earliest of the cold periods was disrupted or destroyed by the action of the Anglian Glacial ice sheets which extended over the whole of the county and reached as far south as the Thames Valley. There is evidence from other parts of the country (The Bristol - Scilly Isles Ice Advance is a good case in point – probably occurring during the Beestonian period, but evidence is confined to south-west England), but in Lincolnshire, such evidence is virtually absent except from bore-hole data.

For this reason, our study of Pleistocene mammals in Lincolnshire is confined mainly to the Ipswichian Interglacial and the Devensian Glacial as evidence for the environmental conditions during these periods is much clearer than that for earlier periods, particularly in Lincolnshire. To understand why this is, we need to look at the action of glaciers and the processes that have led to the deposition of sand and gravel.

Water, Water everywhere....

Glaciers are vast quantities of water. In terms of their inter-action with their environment, glaciers behave like water in slow-motion. They 'flow' like water and erode landscapes as they advance. They are able to transport eroded materials and deposit them in different areas. The speed of the process is much slower than that of a river or stream, but this is off-set by the weight and volume of a glacier. As they advance, they 'scour' the landscape over which they travel, and carry vast quantities of material that has been weathered, either by the glacier itself, or the extreme environmental conditions associated with it. This material can be large or small, coarse or finely weathered and eroded. Examples of the material transportation process often include 'erratics' – stones or boulders weathered and carried by the glacier, often over long distances and deposited in a new area. Erratics are rocks not found in the locality where they have been deposited and can prove very useful in plotting the track of a long disappeared glacier. We know, for example, that the Devensian Ice Sheet travelled from Scotland and down the east coast of Yorkshire before reaching Lincolnshire, because or erratics found in Devensian till (also known as boulder clay) include rocks from Yorkshire and volcanic gneiss from Scotland.

Glaciers melt and freeze as the temperature fluctuates. During periods of cold, they advance and during warmer periods, they retreat. The retreat of glaciers results in the liberation of vast quantities of melting water from the leading edge of the glacier. This glacial meltwater often occurs in torrents transporting vast quantities of material beneath and in front of the glacier, as well as material weathered by the meltwater itself. This material is then carried until the water loses its kinetic energy and deposits the material. This can be in lakes, along the banks of rivers (where the deposited material is known as terraces) or in systems known as braided rivers, where in-situ dumping of material creates mini river deltas with islands of weathered material constantly shifting and altering the course of the river. There is plenty of evidence of the erosive and transporting action of glacial meltwater in areas where glaciers still exist, with Norway (plate 1) and Iceland perhaps the nearest and best-known examples.

Of course evidence of glacial action and the associated processes can be seen across Lincolnshire, although the best place to look for direct impacts on the landscape is the eastern side of the Wolds. There are examples of glacial meltwater valleys (usually deeper-cut valleys or V-shaped valleys) at Hubbard's Hills near Louth, and the eastern 'sea-cliff' was probably cut during the warmer Ipswichian Interglacial when sea levels were considerably higher than they are today – probably as a result of liberated glacial water flooding the North Sea and the slow action of the Earth's crust re-bounding from the weight of the glaciers.

Meltwater is important in our study of Pleistocene mammals as it was meltwater rivers, and the lakes they sometimes formed, which deposited the sand and gravel. Because they were laid down ahead of the retreating glacier, they could be utilised by mammal species. Similarly, the deposition of sand and gravel signifies the end of a cold period and the change to warmer conditions. In terms of placing the various interglacials and glacials in a time-context, the stratigraphy of gravels and peat above and below glacial tills, along with other environmental indicators such as pollen or beetle remains, is key.

As we shall see later, the evidence can and has been interpreted in a number of ways, and on-going work in Lincolnshire is of international importance in answering a number of questions that have perplexed quaternary scientists for decades. That said, we already know much about our late Pleistocene environment, and the interpretation of mammal finds in Lincolnshire gravel pits has a special role to play in this process.

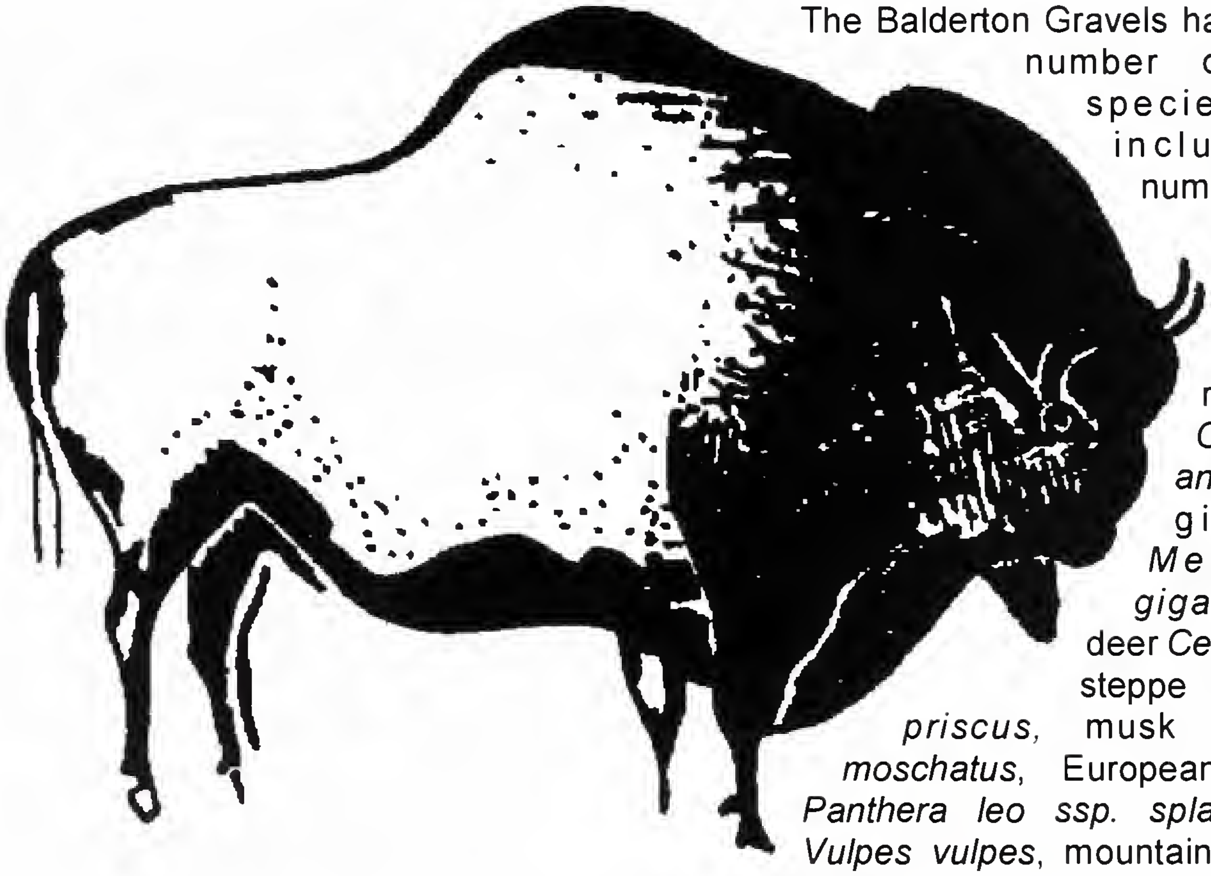
A traveller's guide to Lincolnshire in the late Pleistocene

We already know that the Anglian Ice Sheet covered most of the county 500,000 years ago. Evidence of pre-Anglian ice advances and warm interglacials is present from bore-hole data gathered in the south of the county but, for our purposes, the period we are interested in begins with the decline of the Wolstonian glacial period.

Wolstonian Cold Period - ca. 297,000 – 135,000 b.p.

There is significant controversy about the exact status of this period. The type-site for the Wolstonian period is Wolston in Warwickshire. When first discovered, the till deposits appeared to sit between two interglacial gravel seams. These were assumed (through comparison with other sites) to be Hoxnian and Ipswichian, and this was presented as evidence of glacial action in the English midlands. Subsequent investigation has placed this theory in significant doubt – it appears that the Wolston till is probably Anglian (it is similar to known Anglian tills found in Norfolk), and that the glacial activity during this period was probably confined almost entirely to the North Sea basin (although evidence from Welton-le-Wold may disprove this) . As so much water was locked into the glaciers, the remaining areas of the North Sea and the English Channel were probably dry (although cut by rivers and lakes) and, as a result, Britain was part of the European land-mass.

Regardless of the ice extent, it is clear that Lincolnshire during the Wolstonian was subject to very severe environmental conditions. The nationally important sand and gravel deposits at Balderton that extend as far as Whisby were formed by the proto-Trent river towards the end of the Wolstonian and give a good indication of the mammal fauna of the time. Pollen analysis from other Wolstonian age deposits in Britain suggest an open landscape with a flora of short-lived grasses and hardy sedges that could cope with extended periods of penetrating frosts. This changes slightly towards the end of the Wolstonian, as juniper and dwarf willow become established. In terms of modern equivalents, the sub-arctic tundra of Northern Siberia or Canada probably represent the best examples.

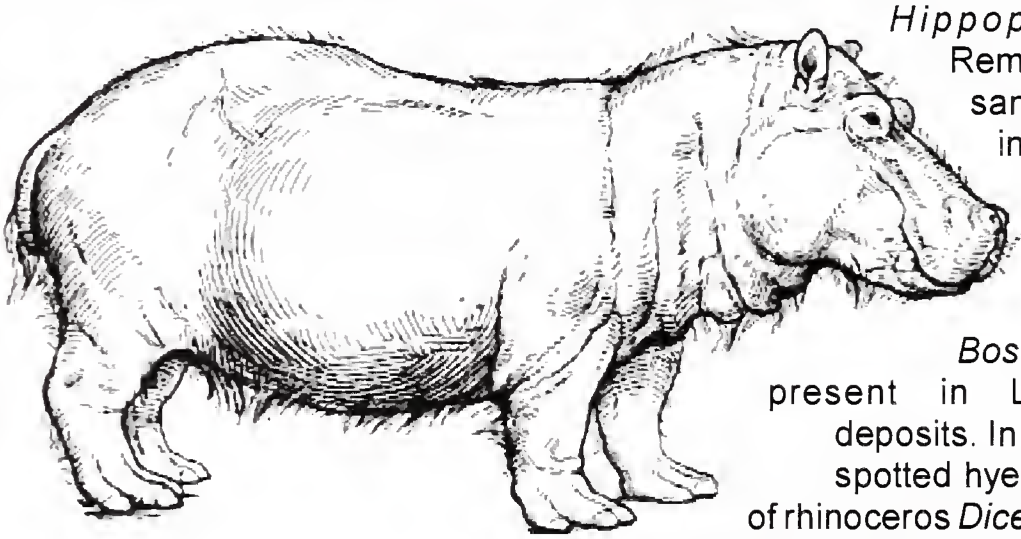

cave art of Bison

The Balderton Gravels have yielded a number of mammal species. These include large numbers of the mammoth *Mammuthus primigenius,* the woolly rhinoceros *Coelodonta antiquitatis*, the giant deer *Megaloceros giganteus,* red deer *Cervus elephas*, steppe bison, *Bison priscus,* musk ox *Ovibos moschatus*, European cave lion *Panthera leo ssp. splaea*, red fox *Vulpes vulpes*, mountain hare *Lepus timidus*, a species of otter *Aonyx antiqua* and Norway and Arctic lemmings *Lemmus lemmus* and *Dicrostonyx torquatus*. Other examples of Wolstonian fauna can be found in cave deposits in Yorkshire and Derbyshire. Here species such as the spotted hyena *Crocuta crocuta*, wolverine *Gulo gulo* and several species of bear *Ursus sp.* have been found.

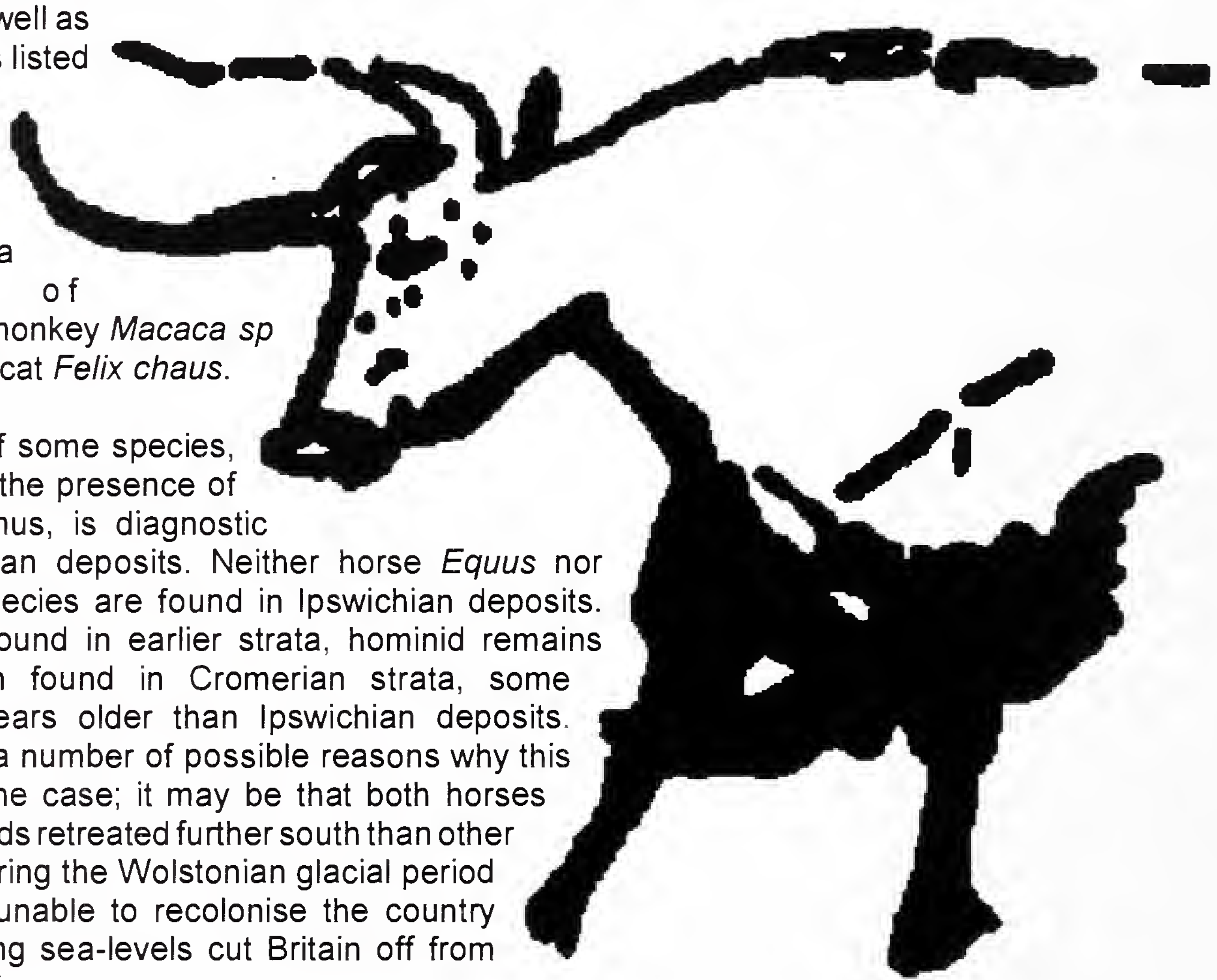
lemming

Ipswichian Warm Period 135,000 – 70,000 years b.p.
The Ipswichian Interglacial was the last great warm period and there is a large amount of Ipswichian material found across the county.
The gravels deposited by the Witham (or possibly the Trent) in the Fulbeck area are Ipswichian in origin, as are some of the gravels found in the Wolds at sites like Welton-le-Wold (plate 2) and there is evidence of the Ipswichian interglacial found in peat deposits that underlie the Devensian gravels at Tattershall Thorpe. The rubified soils in the Balderton Gravels are also considered to be Ipswichian in origin as are the Welland gravel terraces at Deeping St. James.

The evidence contained within these deposits suggest a period that was somewhat warmer than the climate we enjoy today, though subject to fluctuations. Pollen analysis from peat in the Tattershall area and in other parts of the country show that the vegetation cover during this period was probably dominated by a series of forests, with different primary species as the temperature fluctuated. Birch *Betula* and pine *Pinus* species were the earliest tree colonisers after the end of the Wolstonian period. As temperatures increased, pine declined and was replaced by oak *Quercus* and, later, elm *Ulmus*. By the middle part of the Ipswichian, mean summer temperatures were probably 2-3°C warmer than present day, as maple *Acer* and hazel *Coryllus* began to replace elm. In the latter part of the period, forests begin to open up (possibly as a result of grazing from large mammals) and hornbeam *Carpinus* became established, as oak and hazel declined. As this period drew to a close, forest cover returned to pine and birch, prior to tree cover being lost.


Hippopotamus

The most indicative mammal of the Ipswichian Interglacial is the hippopotamus *Hippopotamus amphibius*. Remains of this species, the same as that currently found in Africa, can be found in many Ipswichian sites. The straight-tusked elephant *Palaeoxodon antiquus*, and the auroch *Bos primigenius*, are also present in Lincolnshire Ipswichian deposits. In other parts of the country, spotted hyena, cave lion, two species of rhinoceros *Dicerorhinus hemitoechus* and *D. kirchbergensis*, several bovine species and various other species have been recorded. Some of the most productive sites for Ipswichian mammals are located in London and Essex, along the Ipswichian route of the River Thames. The best known of these is under Trafalgar Square, but there are others. As well as the species listed above, remains from these sites have included a species of macaque monkey *Macaca sp* and jungle cat *Felix chaus*.


cave art of auroch

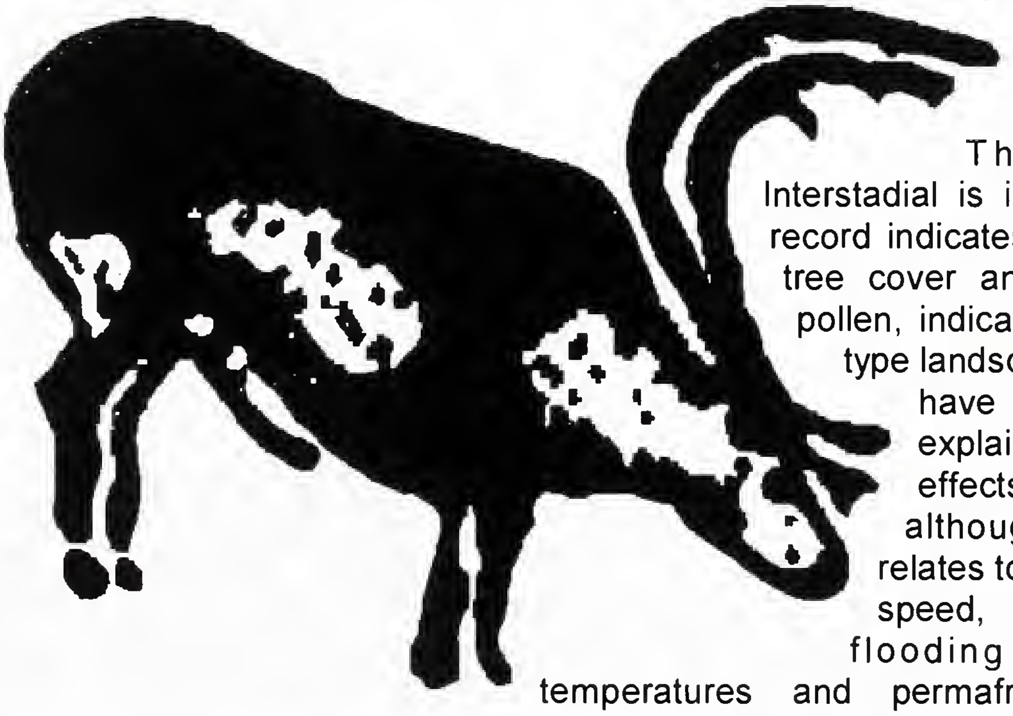
Absence of some species, as well as the presence of hippopotamus, is diagnostic of Ipswichian deposits. Neither horse *Equus* nor hominid species are found in Ipswichian deposits. Both are found in earlier strata, hominid remains have been found in Cromerian strata, some 500,000 years older than Ipswichian deposits. There are a number of possible reasons why this might be the case; it may be that both horses and hominids retreated further south than other species during the Wolstonian glacial period and were unable to recolonise the country before rising sea-levels cut Britain off from mainland Europe.

Devensian Cold Period 70,000 – 10,000 years b.p.
The Devensian was the last period of glacial advance, although evidence suggests that most glacial activity was confined to northern Britain and the North Sea basin (up to and including parts of north Norfolk and eastern Lincolnshire), although the severe environmental conditions were felt across the country. As with previous glaciations, climate fluctuated considerably during the Devensian and several distinct interstadials and ice advances can be identified from this period. The chronology is summerised thus;

Early Devensian - Cheshire Plains ice advance
Chelford Interstadial - slightly warmer interlude
Mid Devensian - major ice advance
Upton Warren Interstadial - warmer interlude
Late Devensian - major advance – formation of Lake Humber
Windermere Interstadial - last mammoth remains in Britain
Loch Lomond Advance - short spell of glacial advance in northern Britain

Some of the largest sand and gravel deposits in Lincolnshire date from this period, including the gravels at Tattershall Thorpe and Kirkby-on-Bain (which are probably mid-Devensian – Rackham; 1978) and some of the till and sand deposits in the Eastern Wolds are late Devensian. Features associated with glacial meltwater – lake and river terrace deposits, can be found across the county. Lake Humber (formed by a glacier blocking the mouth of the Humber) helped create the Humberhead peatlands, and much of the blown sand across the north of the county may have been laid down during this period. The great Fenland Lake was also created from glacial meltwater at this time.

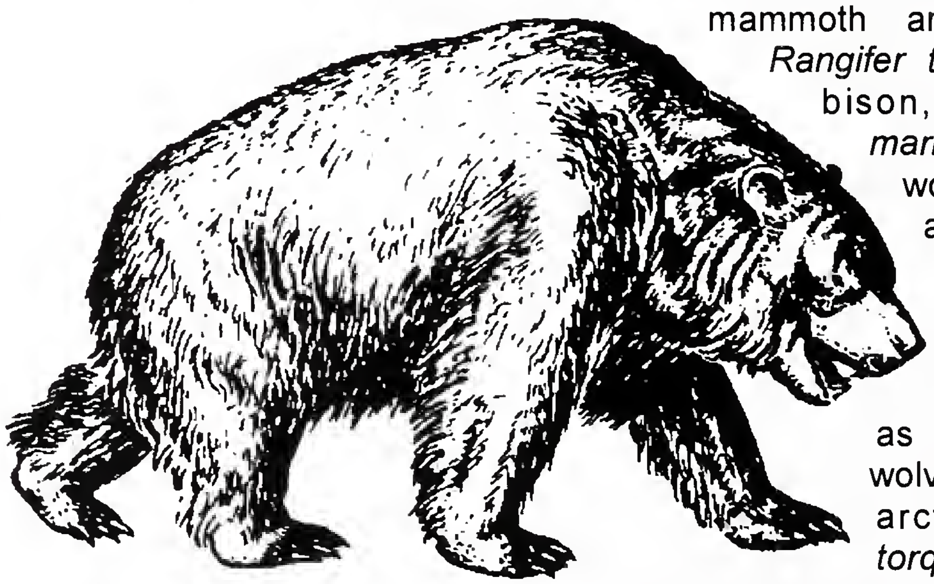
Pollen analysis and examination of beetle remains has told us much about environmental conditions in the Devensian period. Periods of glacial advance were especially severe with permafrost conditions and a flora of ruderal and short-lived annual plants, similar to that of northern Siberia today. The Chelford Interstadial has evidence of pine and birch forest with average mean annual temperatures around +2° C, similar to that found in Northern Finland today. The Upton Warren Interstadial is interesting as the pollen record indicates an almost total lack of tree cover and high levels of grass pollen, indicative of an open, steppe-type landscape. Numerous theories have been put forward to explain this, including the effects of grazing animals, although other speculation relates to high annual mean wind-speed, annual severe spring flooding or severe winter temperatures and permafrost. The Windermere Interstadial also supports evidence of a northern forest



cave art of reindeer

eco-system dominated by willow *Salix*, birch and low shrubs such as bearberry *Arctostaphylos*. Tree cover appears to have been lost from northern and central England during the Loch Lomond Ice Advance, but some pollen evidence exists that suggests that trees were still present in southern England, albeit in smaller populations.

Mammal remains from this period reflect the colder climate. Cave lion is recorded in Lincolnshire as far as the mid-Devensian, along with the mammoth and woolly rhino. Reindeer *Rangifer tarandus*, horse *Equus spp.*, bison, polar bear *Thalarctos maritimus*, Irish or giant elk and wolf *Canis lupus* remains are also found in Lincolnshire deposits. From other parts of the country, finds include extinct species such as cave bear *Ursus spelaeus* as well as still living species such as wolverine, wildcat *Felis syvestris*, arctic lemming *Dicrostonyx torquatus,* European lynx *Lynx lynx*, otter *Lutra lutra*, red fox, pine martin *Martes martes*, several species of horse, brown bear *Ursus arctos* and mountain hare, some of these species surviving the end of the Pleistocene and the beginning of the Holocene.

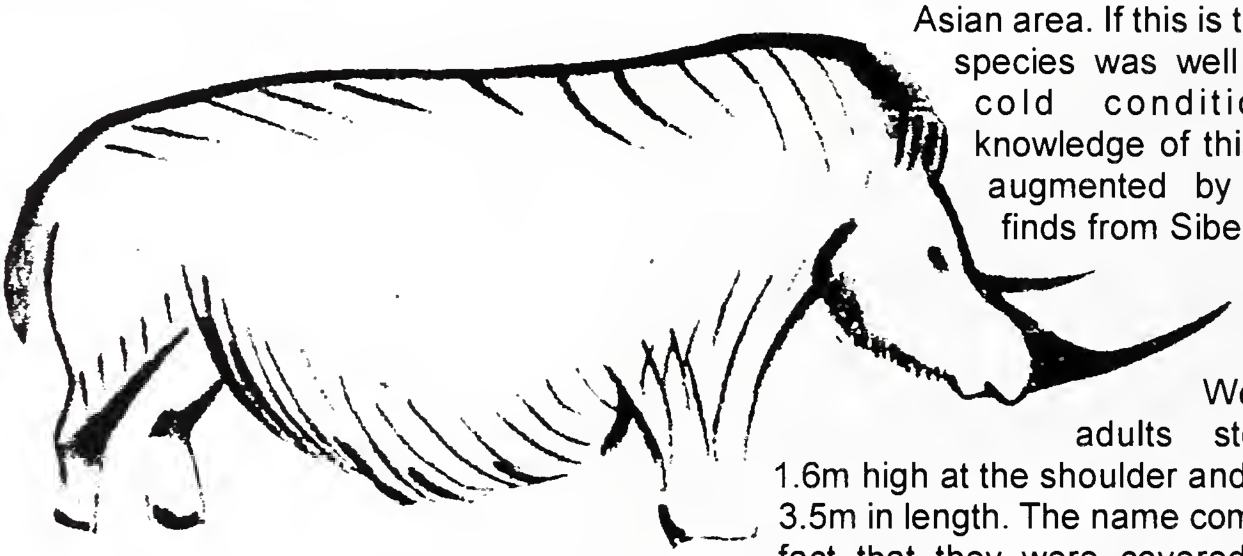


cave bear (after Pomerol 1982)

Now that we have looked at the climate and environmental conditions of the later part of the Pleistocene, we can examine some of the species indicative of these deposits in Lincolnshire.

Woolly Rhinoceros *Coelodonta antiquitatus* (cover illustration)

The woolly rhino probably had its genesis in the early Pleistocene rhinos of China and the east Asian area. If this is the case, the species was well adapted to cold conditions. Our knowledge of this species is augmented by mummified finds from Siberia and from numerous cave paintings. We know that adults stood about 1.6m high at the shoulder and were some 3.5m in length. The name comes from the fact that they were covered in reddish brown hair that formed a mane across the shoulders. The species was twin-horned, although was probably not closely related to modern black rhinos. It appears that the closest living relatives to these species is probably the now severely endangered Sumatran rhinoceros.



cave art of wooly rhino

The species was probably found in areas of open steppe. Peat deposits associated with mummified corpses found in Siberia would appear to confirm this. Remains have been found in caves associated with both cave bear and spotted hyena and therefore may have been a major prey item for mid-late Pleistocene carnivores. They were certainly hunted by palaeolithic humans – cave painting across Europe appear to confirm this. Woolly rhinos have been found in both Wolstonian and Devensian deposits, but appear to be absent from Ipswichian strata, suggesting the species was an animal of cold climates and open habitats. It is therefore possible that the range of the species contracted back to northern Eurasia during interglacial periods but, with the lowering of sea levels and dropping temperatures at the beginning of the Devensian, was able to re-colonise the country from Northern Europe. Although evidence of the species in Britain is not present by the Windermere Interstadial, it probably survived in Northern Siberia until the end of the Loch Lomond Stadial or the very start of the Holocene.

Woolly rhino is one of the more ubiquitous species found in Lincolnshire glacial deposits. Evidence, in the shape of bones, skulls and teeth, have been found in Wolstonian deposits within the Balderton gravels, as well as Devensian deposits at Tattershall Thorpe and around the Deepings. The lack of material from the Ipswichian deposits in Lincolnshire points to at least two different periods of occupation by this species.

Straight-tusked Elephant *Palaeoloxodon antiquus* (plates 3 & 4)
Unlike the previous species, the straight-tusked elephant was a species of temperate Interglacial periods. Augusta & Burian (1960) suggest that the species may have evolved from the giant

Excavation of the straight tusked elephant at Deeping St James in 1996 photo Alan Dawn southern elephant *Archidiskodon meridionalis*, an earlier southern European species that first appears at the start of the Pleistocene period. Larger than the woolly mammoth (described below), this elephant stood approximately 4 metres high at the shoulder, making it also slightly larger than a modern African elephant, to which it is probably related. A diagnostic feature is, as the name suggests, the tusks which were long (up to 1.5 metres) and straight for much of their length, although they curved upwards towards the tip. Relatively few intact skeletons have been found, probably as a result of environmental conditions and greater numbers of scavengers, but bones are relatively frequent in Cromerian, Hoxnian and Ipswichian strata. This suggests three separate periods of occupation of Britain for this species, and evidence from hominid sites in Southern Europe suggest that during glacial periods, this species retreated south, where it was preyed upon by early palaeolithic hunters.

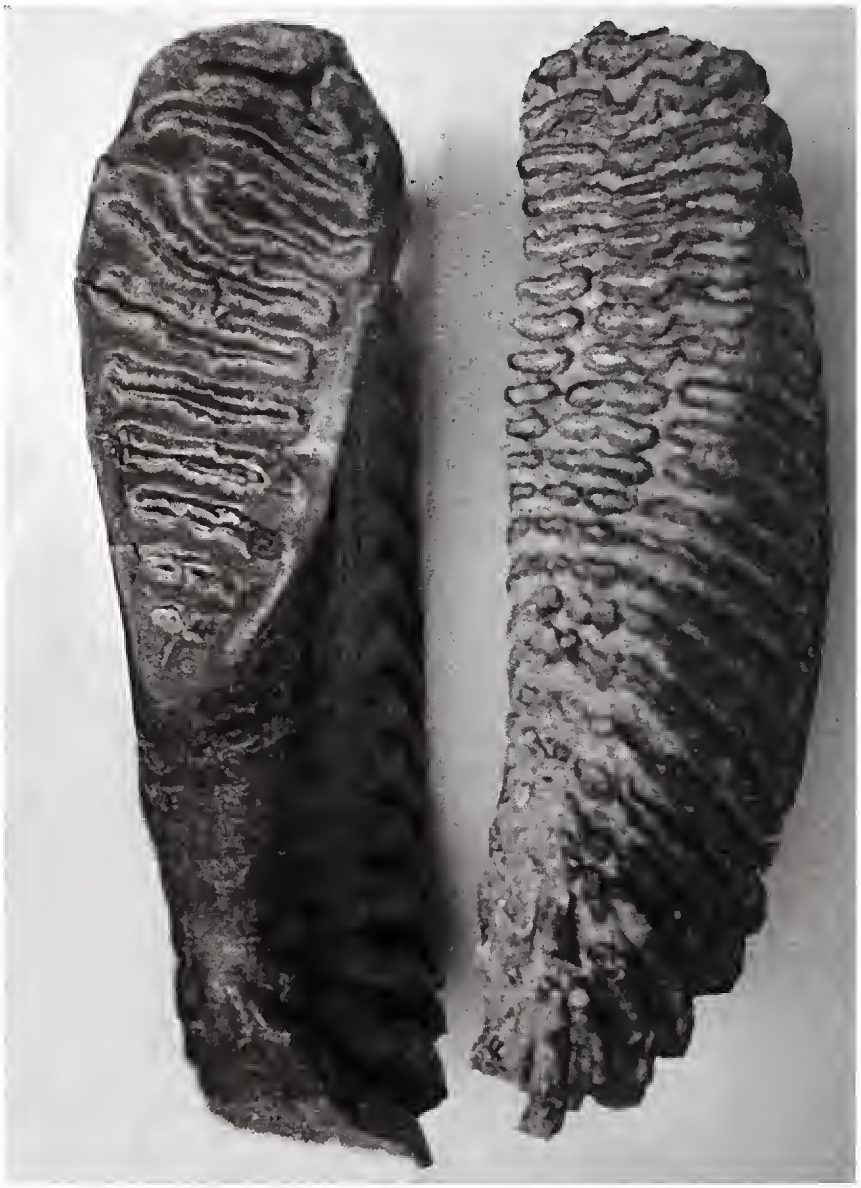
A woodland elephant, this species probably survived in southern parts of Iberia until the early-mid Devensian period. Remains are confined entirely to the Eurasian land mass. Interestingly, it appears to have co-existed with species like the steppe mammoth *Mammuthus trogontherii* and woolly mammoths during the closing periods of interglacials as some finds show that the species was found as far north as the conifer belt, although they have not been found within the same strata on the same site.

Evidence for the its presence in Lincolnshire is confined to Ipswichian deposits at Deeping St James and from sites at Fulbeck and Welton-le-Wold. The most famous of these Lincolnshire finds, is the so-called 'Deepings Elephant' (plate 4), It appears to have been a relatively common interglacial species, with most temperate climate deposits supporting mammalian remains yielding examples.

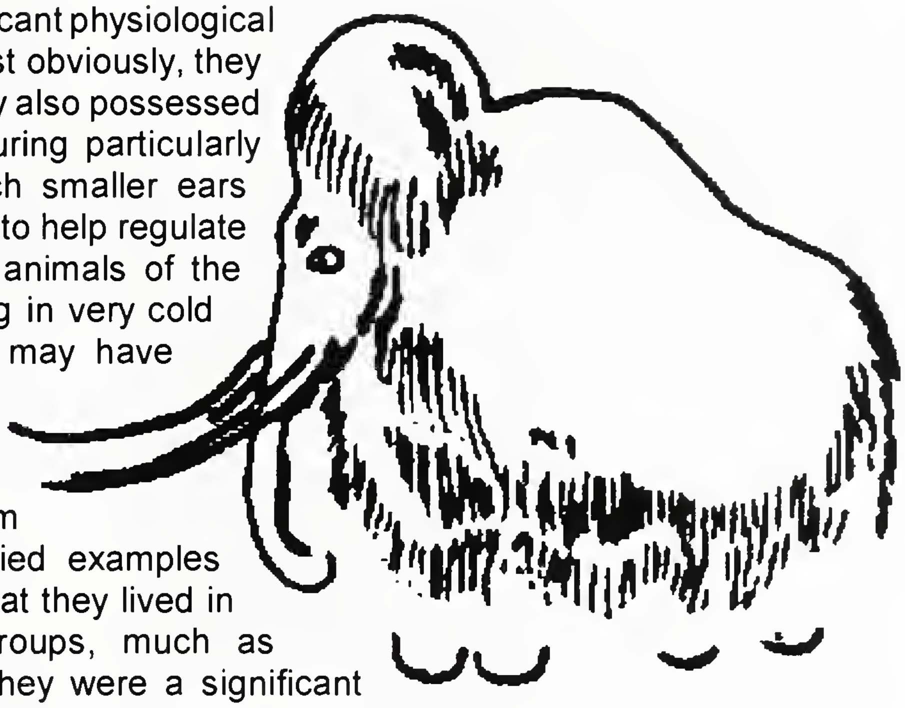
Woolly or Eurasian Mammoth
Mammuthus primigenius

Perhaps the archetypal 'Ice Age' animal, the woolly mammoth was one of a series of mammoth/mastodon elephants, the taxonomy of which is still subject to debate. To clarify for the curious, the term 'mammoth' is generally used to identify species resident in Europe and Asia, whereas 'mastodons' refers to American species. This is somewhat confused by the use of the term mammoth for temperate American species.

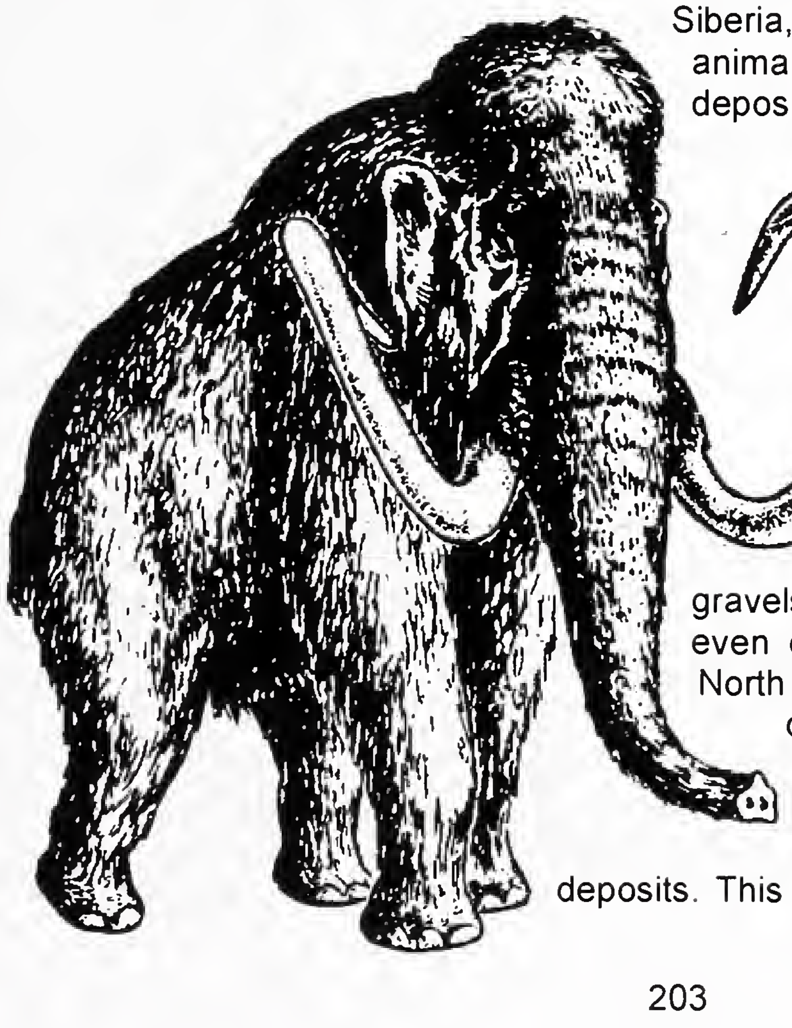
The woolly mammoth was a species well suited to life in a cold climate. In



Contrasting teeth of straight-tusked elephant (l) and woolly mammoth (r). photo Allan Dawn comparison to modern elephants (which were not closely related) a number of significant physiological differences have been noted. Most obviously, they were covered in thick hair, but they also possessed a fat hump for storing energy during particularly severe periods, as well as much smaller ears (modern elephants use their ears to help regulate body temperature). These were animals of the open steppe, capable of surviving in very cold conditions. Grass grazers, they may have lived semi-nomadic existences, migrating south with the availability of food. From cave paintings and some evidence from both glacial strata and mummified examples found in Siberia, it is assumed that they lived in small herds, possibly family groups, much as modern African elephants do. They were a significant source of food for early palaeolithic hunters.


cave art of mammoth

The woolly mammoth may have survived the end of the Pleistocene and the start of the Holocene, but had probably become extinct by about 9,000 b.p. The reasons for it's extinction are almost certainly related to it's inability to adapt to warmer post-glacial conditions and was not related to over-hunting by Palaeolithic humans. The last examples in Britain date from the last Devensian Ice Advance and the species probably became extinct prior to the Loch Lomond Ice Advance. It's last known stronghold was in Siberia, where remarkably well preserved animals are occasionally dug out of peat deposits.


mammoth (after Pomerol, 1982)

Mammoth remains are common in many glacial deposits in Lincolnshire. Wolstonian gravels at Whisby have yielded them (including one bone during an LNU field meeting in 1999!) and they are probably the most frequent mammal find in the Devensian deposits at sites such as Tattershall Thorpe and in the gravels around Baston and Langtoft. Finds are even occasionally made on the bed of the North Sea, indicating that this area was once dry land. Interestingly, the ancestral species of the woolly mammoth, the steppe mammoth, has been found in at West Runton, Norfolk in Cromerian deposits. This suggests that the steppe mammoth –

Roger & Rosy Key with mammoth bone found on LNU meeting at Whisby in Feb 1999 photo D.Bromwich

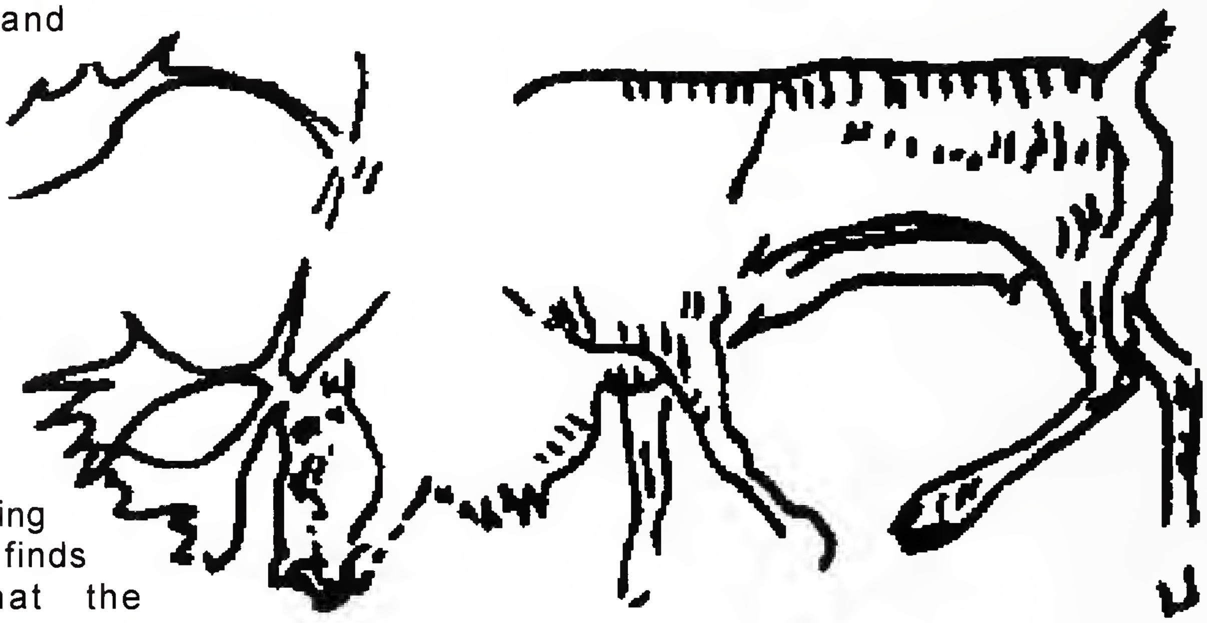
considerably larger than the woolly mammoth - was the 'missing link' between temperate elephants such as *Palaeoloxodon* and the woolly mammoth. It certainly appears to share significant physiological similarities with both species. The remains of this mammoth can be seen at Norwich Museum

Giant or Irish Elk *Megaloceros giganteus*

A species with a definite western distribution (at least as far as the evidence suggests) in Britain, the Irish elk was neither an elk, nor was it confined to Ireland. Augusta & Burian (1960) state that the species was probably part of the same group as modern fallow deer, although this is refuted by a number of more recent studies, and its ancestry can be traced though a group of earlier temperate *Megaloceros* species from central and eastern Europe.

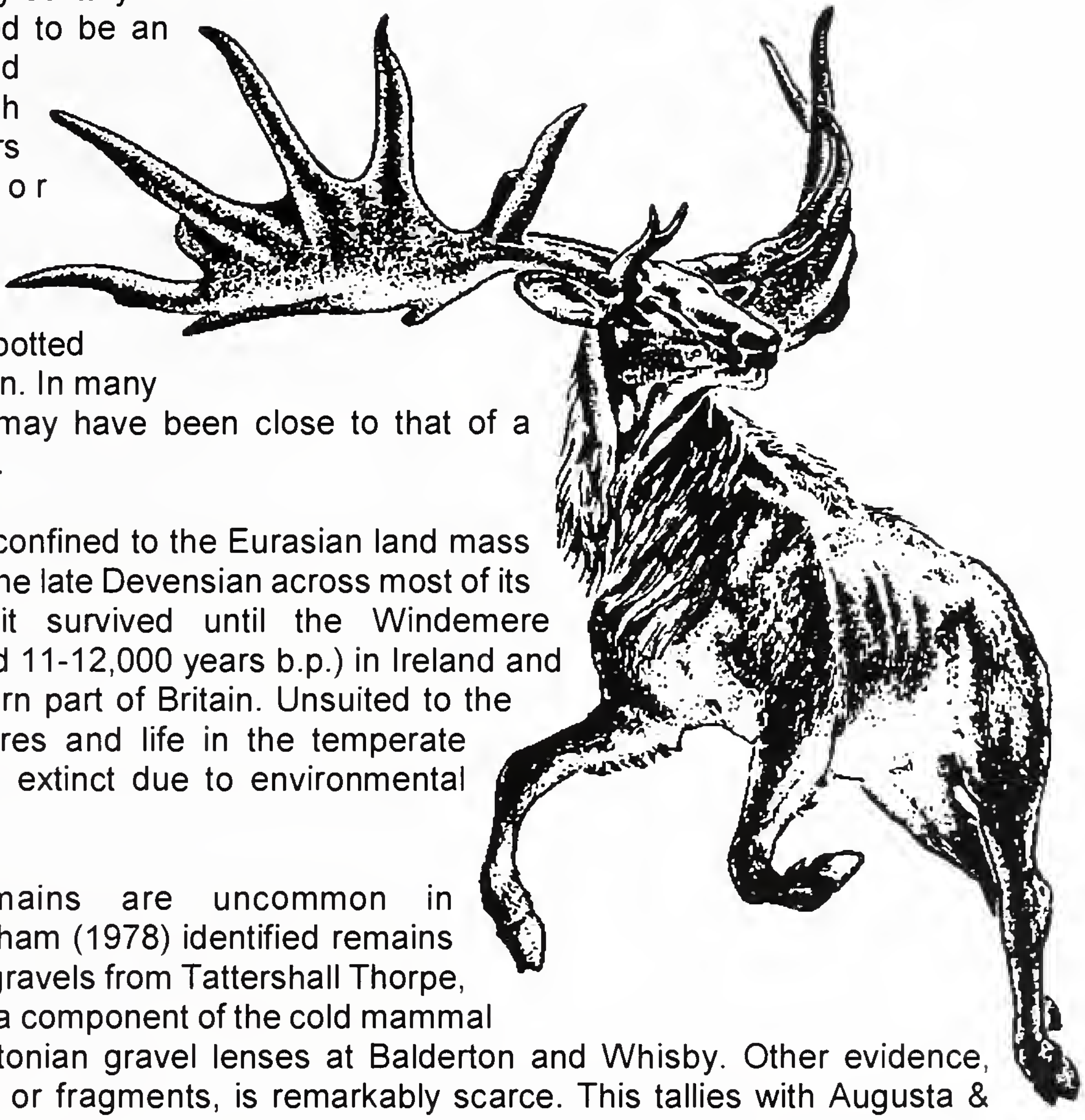
Approximately the size of a modern elk *Alces alces*, *Megaloceros* is first recorded in Wolstonian deposits, although it is more common in Devensian strata, particularly in Britain and Ireland, where it is found in peat bogs. The most startling thing about the Irish elk were the size of it's antlers. Large males could have an antler span of over 2.5 metres, with exceptional examples measuring over 3.5 metres from tip to tip. With such a large set of antlers, life in temperate woodlands would have been impossible, and the species was almost certainly a species of open steppe grassland and sub-arctic tundra, this being supported by analysis of peat deposits that support *Megaloceros* remains.

Cave painting and peat finds suggest that the



cave art of giant elk

species was largely solitary. It undoubtedly proved to be an important food source to both Palaeolithic hunters and also for Wolstonian and Devensian predators such as the wolf, spotted hyena and cave lion. In many ways, its lifestyle may have been close to that of a modern elk/moose.


giant elk (after Pomerol, 1982)

Megolaceros was confined to the Eurasian land mass and survived until the late Devensian across most of its range, although it survived until the Windemere Interstadial (around 11-12,000 years b.p.) in Ireland and possibly the western part of Britain. Unsuited to the warmer temperatures and life in the temperate forests, it became extinct due to environmental reasons.

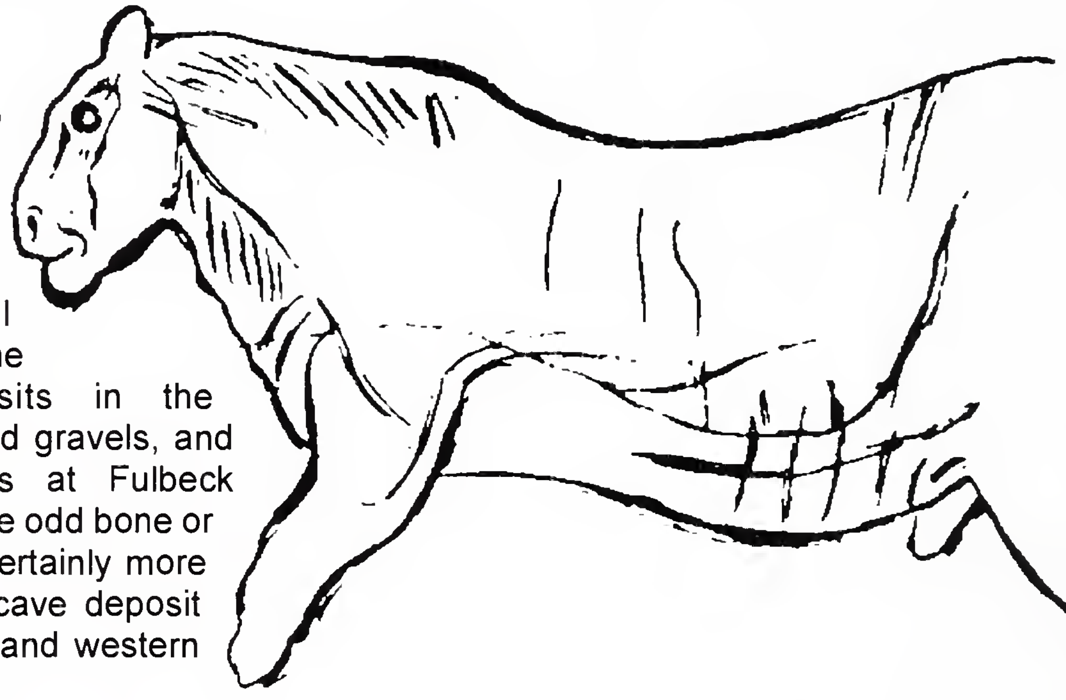
Megolaceros remains are uncommon in Lincolnshire. Rackham (1978) identified remains in mid-Devensian gravels from Tattershall Thorpe, and the species is a component of the cold mammal fauna in the Wolstonian gravel lenses at Balderton and Whisby. Other evidence, usually antler core or fragments, is remarkably scarce. This tallies with Augusta & Burian (1960), who identify the species as an uncommon find in Devensian strata.

Eurasian Cave Lion *Panthera leo spelaea*
The cave lion is different from all the other extinct species mentioned above in a number of key ways. Firstly, along with the wolf, spotted hyena, wolverine and polar bear, it was the most important predator of the mid-late Pleistocene in Britain. It is also interesting in that it can be found in both glacial and interglacial deposits in the UK, making it one of the few species where this can be demonstrated.

Remains have been found in Hoxnian deposits, deposits laid down in the Wolstonian cold period and in Ipswichian interglacial deposits. They are common in the Ipswichian deposits in caves in Yorkshire and Derbyshire. In mainland Europe they were drawn in cave paintings by early Palaeolithic hunters, but most of our knowledge of the species comes from a number of well preserved examples of the closely related species *Panthera leo atrox* from North America.

Cave paintings suggest that they were solitary animals for the vast majority of their life. Evidence from American tar-pits and from bones and cave paintings suggest a size range from roughly the size of the African lion up to about 25% larger. They appeared to be more thick- set, but with longer, more slender limbs. Males appear to have had manes, although not as full as those of current African lions. Cave paintings appear to show animals with tiger-like stripes, although this is unconfirmed.

In Lincolnshire, remains of cave lion are not commonly found. It is part of the mammal assemblage of the Wolstonian deposits in the Balderton sands and gravels, and Ipswichian deposits at Fulbeck have also yielded the odd bone or tooth. Fossils are certainly more common from the cave deposit sites in the central and western part of the country.


cave art of cave lion

There are no examples of Devensian cave lion remains, suggesting that it was extinct in Britain by the middle of this ice advance. It is not known why such an extinction may have taken place.

These are just a few of the species that once roamed wild across Lincolnshire. As further sand and gravel deposits are exploited, more and more evidence will be discovered that will help us to get an even better picture of Lincolnshire 100,000 years ago. These time capsules are constantly turning up new examples of a lost Lincolnshire fauna, and as Quaternary specialists and paeleoecologists examine these finds, so our knowledge of a frozen county inhabited by long-extinct beasts will grow.

Acknowledgements
I'd like to thank John Aram and James Rackham for help, advice and information whilst I was researching this address, and Helen Gamble, for the woolly rhino illustration. I am not a geologist, and they have helped me round the controversy of British Quaternary history. If there are errors here, the responsibility ends with me. Thanks also to the many other geologists and scientists who have contributed so much to our knowledge of Ice Age Lincolnshire, particularly Professor Allan Straw, whose work at Welton-le-Wold was a major influence on the choice of this subject as an address.

Neil Pike was the 109th President of the Lincolnshire Naturalists' Union and this paper represents his presidential address to the Union, given at Whisby Nature Park Education Centre in March 2003. He first got interested in natural history after watching a red-backed shrike impaling cockchafers on the thorns of a blackthorn bush. A keen birdwatcher, an interest in palaeoecology and particularly ice-age mammals was ignited after being given a copy of Augusta & Burian's 'Prehistoric Plants and Animals' as a young boy. Voluntary work in the Peak District National Park was followed after graduating from University by 9 years in various posts with the Lincolnshire Trust, including a spell working on Welton-Le-Wold Gravel Pit SSSI, the inspiration behind this article. Neil is now a Conservation Officer working for English Nature.

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THE BEES (HYMENOPTERA: APIDAE) OF WATSONIAN LINCOLNSHIRE. 1. SILK BEES (*COLLETES*) WITH THEIR CUCKOOS (*EPEOLUS*) AND YELLOW-FACED BEES (*HYLAEUS*).

Michael E. Archer

This is the first of a series of papers to present the records of the aculeate bees of Watsonian Lincolnshire. This paper deals with the yellow-faced (*Hylaeus*) and silk (*Colletes*) bees with the cleptoparasites of the silk bees (*Epeolus*). An introduction to these bees can be gleaned from Nixon (1954), Andrewes (1969), O'Toole & Raw (1991), Michener (2000) and Weiss (2002). Else (in preparation), when published, will be the standard book on the British bees dealing with the natural history of each species in detail besides giving illustrated keys to all the species. The current major sources of information are the Provisional Atlases of the Bees, Wasps and Ants Recording Society (BWARS). These provide a national distribution map and detailed natural history information for each species. These atlases are far from complete, but the relevant one will be indicated as each species is considered.

This paper considers 126 records where a record represents a specimen differing in one of the following three variables: name, sex and day-date of capture or observation. The records were made by eleven persons from 14 sites. The recorders were M.E. Archer (MEA), H. Britten (HB), J.W. Carr (JWC), C.F. George (CFG), A. Godfrey (AG), M.W. Graham (MWG), D.S. Hill (DSH), A.S. Lazenby (ASL), S.P.M. Roberts (SPMR), R.W.J. Uffen (RWJU) and P.F. Yeo (PFY). The sites with their grid references and Natural Areas (Weaver; 1998) are given the appendix. The sites are distributed between the following five Natural Areas (Weaver; 1998): North Lincolnshire Coversands and Clay Vale (7 sites), Lincolnshire Coasts and Marshes (3 sites), Trent Valley and Rises (1 site), Lincolnshire and Rutland Limestone (2 sites) and the Fens (1 site).

For each species the records are given in year order, together with number of records in the atlas (Edwards & Telfer; 2001 (*Hylaeus*), Edwards & Telfer; 2002 (*Colletes & Epeolus*)). and date span within the year. The year of some of the records of M.W. Graham are not known so are given as 1941, the date of his paper (Graham; 1941). The national status (NS) (Falk; 1991) and Archer national status (ANS) (Archer; 2002) are given for each species.

The Yellow-faced Bees

The yellow-faced bees (*Hylaeus* Fabricius, 1793) are solitary, small (3-6mm), black, hairless bees with a short, blunt tongue which is bilobed at the tip. Limited yellow makings are usually present on the head (particularly the face), thorax and legs. There are no hairs on the body for carrying pollen, which is carried with the nectar in the crop. These bees are aerial nesters, usually using pre-existing cavities in dead stems, e.g. bramble, rose, dock, but also other crevices such as old beetle burrows and nail holes in wood, holes in walls and stones and even cavities in the soil. Some dead dock stems left in the garden usually leads to colonisation by *H. communis*. They are active as adults during the summer being found in a wide range of open habitats. They are polylectic (collecting pollen from a large number of unrelated plant species) often to species of the flowering plant families of Apiaceae, Fabaceae and Rosaceae.

The males and females emerge during the late spring and early summer and after mating the females seek suitable nesting sites. The cells are linearly arranged with the walls derived from a secretion to give a waterproof wall appearing like cellophane. A semi-liquid food store of pollen and nectar is placed in each cell on which is laid an egg. There is one generation per year and the over-wintering stage is a diapausing prepupa. Nationally, there are 12 species with four in Lincolnshire. Further species will probably be found.

A yellow-faced bee *Hylaeus communis* photo Roger Key

Hylaeus brevicornis Nylander, 1852.
ANS Widespread. 9 records. 10 May-8 September. Skegness, 1900, JWC; Woodall Spa, 1948, MWG; Saltfleetby-Theddlethorpe dunes, 1984, MEA; Risby Warren, 1985, MEA; Rauceby Warren, 1995, 1996, 2002, MEA; Laughton Common, 1996, AG.

Hylaeus communis Nylander, 1852.
ANS Widespread. 22 records. 6 June-26 August. Skegness, 1900, JWC; Old Bolingbroke, 1941, MWG, Woodhall Spa, 1949, MWG; Grantham, 1950, HB; Saltfleetby-Theddlethorpe dunes, 1984, 1986, MEA; Risby Warren, 1984, MEA; Gibraltar Point, 1991, 1995, 1996, MEA; Blankney Fen, 1992,ASL; Rauceby Warren, 1992, 1993, 2002, MEA; Messingham Sand Quarry, 1993, 1999, MEA; Laughton Common, 1996, RWJU; Kirkby Moor, 1997, MEA.

Hylaeus confuses Nylander, 1852.
ANS Universal. 9 records. 25 June-26 August. Old Bolingbroke, 1941, MWG; Saltfleetby-Theddlethorpe dunes, 1984, 1995, 1998, MEA.

Hylaeus hyalinatus Smith, 1842.
ANS Widespread. 5 records. 14 June-10 September. Woodhall Spa, 1948, MWG; Saltfleetby-Theddlethorpe dunes, 1984, MEA; Gibraltar Point, 1996, SPMR; Rauceby Warren, 2002, MEA.

The Silk Bees
The silk bees (*Colletes* Latreille, 1802) are solitary, medium to large (6 to over 10mm), hairy, short-tongued bees. The tongue is broad and bilobed at the tip. The cuticle is black, although some times the first tergum is posteriorly reddish. Conspicuous pale bands of dense decumbent hairs are present on the gastral terga. Pollen is carried mainly in the scopa on the tibiae, femora and sides of the propodeum. They are subterranean nesters in friable soil, soft mortar and soft sandstones often nesting in aggregations. The adults are active during the summer and probably all species are oligolectic, collecting pollen from a single species or closely related group of plant species.

The straight burrow leads to several cells, each cell either having a short lateral burrow or the main burrow terminating in a cluster of cells. The earthen cells are lined and water-proofed by a secreted cellophane-like material and are provisioned with a semi-liquid store of pollen and nectar. The egg is attached to the upper wall of the cell which is closed by a lid of cellophane-like material. There is one generation a year, with an over-wintering stage which is generally a diapausing prepupa. Their cleptoparasites are from the genus *Epeolus*. Nationally, there are nine species, with five in Lincolnshire.

Colletes daviesanus Smith, 1846.
ANS Universal. Edwards & Telfer 2002. 8 records. 23 June-15 August. Associated with a wide range of open habitats including urban sites. Probably oligolectic for pollen sources on species of the family Asteraceae. Old Bolingbroke, 1941, MWG; Laughton Common, 1996, AG; Moor Closes, 1997, ASL; Messingham Sand Quarry, 1999, 2000, 2001, MEA.

Colletes fodiens (Geoffroy *in* Fourcroy, 1785).
ANS Widespread. Edwards & Telfer 2002. 18 records. 17-22 August. Associated with open sandy habitats both on the coast and inland. Possibly oligolectic for pollen sources on species

of the family Asteraceae. Old Bolingbroke, 1941, MWG; Skegness, 1941, MWG; Saltfleetby-Theddlethorpe dunes, 1984, MEA; Risby Warren, 1984, 1985, MEA; Gibraltar Point, 1989, 1995, 1996, 1997, MEA, 1994, PFY, 1996, SPMR; Messingham Sand Quarry, 2000, MEA.

Colletes halophilus Verhoeff, 1944.
NS Na. ANS Restricted. Edwards 1997. 6 records. 6 July-16 September. Associated with salt marshes, nesting on sandy soils at the edges of salt marshes. Pollen sources from salt marsh plants such as *Aster tripolium*. Gibraltar Point, 1982, 1990, DSH, 1989, MEA, 1996, SPMR; Saltfleetby-Theddlethorpe dunes 1984, 1989, MEA.

Colletes similes Schenck, 1853.
ANS Widespread. Edwards & Telfer 2002. 1 record. 16 July. Associated with a wide range of open habitats. Probably oligolectic for pollen sources on species of the family Asteraceae. Kirby Moor, 1996, MEA.

Colletes succinctus (Linnaeus, 1758).
ANS Universal. Edwards & Telfer 2001. 21 records. 30 July-29 September. Associated with dry heathland and moorland, much less with coastal dunes. Oligolectic for pollen sources from *Calluna* and *Erica*. Kirton-in-Lindsay, pre-1889, CFG; Old Bolingbroke, 1941, MWG; Risby Warren, 1984, 1985, 1986, MEA; Saltfleetby-Theddlethorpe dunes, 1984, MEA; Kirkby Moor, 1989, 1991, 1994, 1999, MEA; Messingham Sand Quarry, 1992, 1994, 1995, 1996, 1999, 2000, 2001, MEA.

The Cuckoo Bees of the Silk Bees

The cuckoo bees (*Epeolus* Latreille, 1802) are cleptoparasitic on silk bees (*Colletes*). They are medium size (6-10mm) long-tongued bees. The cuticle is black with the thorax and gaster having conspicuous areas of white or cream-coloured patches of dense, very short hairs.

The female enters an open cell of its host and inserts an egg into the wall of the cell. The first instar larva with its long curved mandibles destroys the host's egg and the provisions are then eaten. They are summer species with one generation a year. Nationally, there are two species, both occurring in Lincolnshire.

Epeolus cruciger (Panzer, 1799).
ANS Widespread. Edwards & Telfer 2002. 6 records. 2 August-10 September. Cleptoparasitic on *Colletes succinctus*. Kirton-in-Lindsay, pre-1907, CFG; Woodhall Spa, 1948, MWG; Kirby Moor, 1989, 1991, MEA.

Epeolus variegatus (Linnaeus, 1758).
ANS Widespread. Edwards & Telfer 2002. 21 records. 25 June-22 August. Cleptoparasitic on *Colletes daviesanus*, *C. fodiens* and *C. halophilus*. Kirton-in-Lindsay, pre-1889, CFG; Old Bolingbroke, 1941, MWG; Saltfleetby-Theddlethorpe dunes, 1984, 1985, MEA; Risby Warren, 1984, 1985, MEA; Gibraltar Point, 1991, DSH, 1994, PFY, 1996, SPMR, 1996, MEA; Kirby Moor, 1997, MEA; Messingham Sand Quarry, 1999, 2000, 2001, MEA.

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Appendix – The grid references and natural areas of sites. The actual location of some sites (3, 5, 9, 13, 14) are unknown, so that grid references for these sites can only be approximate.

1. Blankney Fen, TF1262, Fens.
2. Gibraltar Point, TF5557, Lincolnshire Coasts and Marshes.
3. Grantham, SK9136, Trent Valley and Rises.
4. Kirkby Moor, TF2262, Coversands and Clay Vale.
5. Kirton-in-Lindsay, SK9398, Coversands and Clay Vale.
6. Laughton Common, SK8599, Coversands and Clay Vale.
7. Messingham Sand Quarry, SE9103 Coversands and Clay Vale.
8. Moor Closes, SK9843, Lincolnshire and Rutland Limestone.
9. Old Bolingbroke, TF3564, Coversands and Clay Vale.
10. Rauceby Warren, TF0343, Lincolnshire and Rutland Limestone.
11. Risby Warren, SE9313, Coversands and Clay Vale.
12. Saltfleetby-Theddlethorpe dunes, TF4791, Lincolnshire Coasts and Marshes.
13. Skegness, TF5663, Lincolnshire Coasts and Marshes.
14. Woodhall Spa, TF1963, Coversands and Clay Vale.

THE LINCOLNSHIRE CHALK STREAMS PROJECT: BACKGROUND AND BOTANICAL AND AQUATIC MACRO-INVERTEBRATE SURVEYS UNDERTAKEN IN 2000/2001

Tim Smith, Ecological Services Ltd.
& Richard Chadd, Environment Agency

Background

Chalk streams are particular watercourses whose flow is dominated by ground-water discharge from chalk geology aquifers. They have a distinctive water chemistry, a generally stable flow regime, a generally stable temperature regime (especially close to source) and clear water on account of the filtering effect of the rock. These factors combine to support characteristic communities of plants and animals (eg Holmes *et al*, 1999).

England has the major part of Europe's chalk stream resource (Anon, 1995) and, on account of this, chalk streams have been identified by the UK Biodiversity Steering Group as a Priority Habitat nationally and a Habitat Action Plan (HAP) is given in Anon (1995). Subsequent recognition locally came in the Lincolnshire Biodiversity Action Plan (Farrow & Wright, 2000), since this county includes examples of the habitat. Lincolnshire is near to the country's northern limit of chalk streams, which occur in and downstream of outcrops of chalk in a broad band stretching from Dorset, Hampshire and Wiltshire in the south-west, up to the East Riding of Yorkshire in the north, taking in parts of Oxfordshire, Hertfordshire, Bedfordshire, Cambridgeshire, Suffolk and Norfolk, with outliers in Kent. A provisional map of rivers and streams in England with a "strong chalk influence" is given by English Nature/Environment Agency (1999).

The Environment Agency is the organisation with lead responsibility for progressing work on the chalk streams HAP, in partnership with other organisations. In the Agency's Anglian Region Northern Area (in which historical Lincolnshire lies) the Lincolnshire Chalk Streams Project has been set up to take forward the HAP's objectives which are relevant to this county. One of the objectives of the HAP which is relevant to Lincolnshire is the need to "assess the nature conservation value and potential for restoration of chalk streams other than those which are Sites of Special Scientific Interest (SSSI)/candidate Special Area of Conservation (cSAC)". There are at present no watercourses in Lincolnshire which are notified as SSSI specifically for chalk stream features, hence no cSAC sites. However, some stretches of river with chalk stream characteristics have nonetheless been included in SSSIs, as an incidental or boundary feature to qualifying terrestrial habitats. Thus, according to the above criterion set by the HAP, every watercourse which could be defined as a chalk stream in Lincolnshire requires the assessment of its nature conservation value, since this is currently unknown.

The Agency recognised that it was therefore both necessary and important to define which watercourses in the county are chalk streams, which would give an idea of the potential size of the task ahead. The Agency commissioned Applied Environmental Research Centre Ltd (AERC) to undertake the work necessary to define and identify chalk streams in Lincolnshire on the basis of geological and hydrological features. The report of this work (AERC, 2000) produced lists of watercourses which could be considered as 'Classic Chalk Rivers' or 'Mixed Geology

Chalk Rivers' (with sub-divisions in each category of "definite" and "possible"), or 'Winterbourne' or 'Spring'. A general paucity of biological information on all these sites was noted although a few records were found and were drawn together in this report. These included the flatworm *Crenobia alpina* at Claxby Spring TF448715, a well known station for this species, eg Crooks (1989) and at Belleau Springs TF402783 (plate 6), another well known site, (eg Smith; 1988).

The AERC report helped the Agency draw up an initial list of chalk stream sites (mainly springs and headwaters) for which botanical and aquatic macro-invertebrate data were sought. The original list was reduced to 43 sites which were thought most likely to hold biological interest, which had good access, and which lay upstream of Agency biological water quality monitoring sites, data from which could be used to provide a wider picture of chalk stream biodiversity. The 43 sites lay in the upper parts of the following catchments: Great Eau (9 sites), River Lud (9), River Rase (4), Waithe Beck (16) and Thoresway Beck (5 sites). Sites thereby lay on both sides of the Wolds, with the Rase sites lying below the west-facing scarp slope, and the remainder lying on the east-facing dip slope. Agency biologists surveyed aquatic macro-invertebrates in the summer of 2000 and in the winter 2000/2001, and the Agency commissioned ESL (Ecological Services) Ltd in Horncastle to undertake habitat and botanical surveys in the period late July-late September 2000. An outline of the results of these surveys is given below.

Belleau Springs, one of the headwater springs of the Great Eau chalk river. photo T Smith

Results of Habitat and Botanical Studies

Upper Great Eau Sites

The nine sites on the upper Great Eau lie on seven separate headwaters and are located in the area roughly defined by Farforth-South Ormsby-Swaby-Belleau. The sites comprise five lengths of small stream, one stretch of larger stream (through Swaby Valley), the vigorous springs and pool at Belleau (plate 6), and springs and seepages at one other site.

Well-defined springs supported a bryophyte dominated flora characterised by *Cratoneuron filicinum*, *Aneura pinguis* and *Rhynchostegium riparioides*, with smaller amounts of *Brachythecium rutabulum*, *Conocephalum conicum* and *Pellia endiviifolia*. Diffuse seepages had a higher plant-dominated flora which comprised species typical of wet woodlands or tall-herb areas generally, eg *Iris pseudacorus*, *Poa trivialis*, *Epilobium hirsutum*, *Geum rivale*, *Ranunculus repens* and *Scrophularia auriculata*, with bryophytes reduced or absent. Where the stream sites were much shaded, the flora was sparse and typically included *Cratoneuron filicinum*, *Agrostis stolonifera*, *Apium nodiflorum*, *Rhynchostegium riparioides*, *Amblystegium riparium*, *Epilobium hirsutum*, *Myosotis scorpioides*, *Filipendula ulmaria*, *Aneura pinguis* and *Ranunculus repens*. Where the stream sites were open, the flora was dominated by higher plants and was more extensive and diverse. Species noted in these situations included *Rorippa nasturtium-aquaticum*, *Carex acutiformis*, *Apium nodiflorum*, *Phragmites australis*, *Geum rivale*, *Eupatorium cannabinum*, *Angelica sylvestris*, *Juncus effusus*, *Juncus inflexus*, *Hypericum tetrapterum*, *Scrophularia auriculata*, *Filipendula ulmaria*, *Epilobium hirsutum*, *Mentha aquatica* and *Ajuga reptans*. This flora culminated in that of the stream through Swaby Valley, where a rich flora occurs including many of the above species, as well as *Berula erecta*, *Elodea canadensis*, *Veronica catenata*, *Cirsium palustre*, *Epilobium parviflorum*, *Lotus pedunculatus* and *Pulicaria dysenterica*. Stones and tree/bush roots in the open stream sites supported *Amblystegium riparium*, *Cratoneuron filicinum*, *Aneura pinguis*, *Pellia endiviifolia* and *Rhynchostegium riparioides*. The pool at Belleau Springs supported *Zannichellia palustris*, *Callitriche obtusangula* and *Ranunculus penicillatus* subsp. *pseudofluitans*.

Upper River Lud Sites

The nine sites on the upper River Lud lie on six separate headwaters and are located in the area roughly defined by Tathwell-Hubbard's Hills-Withcall. The sites comprise five lengths of small stream, one ditch, one reach of moderately-sized stream and two sites which are springs feeding pools with small streams exiting them.

Well-defined springs supported a bryophyte-dominated flora of *Rhynchostegium riparioides*, *Cratoneuron filicinum*, *Aneura pinguis* and *Pellia endiviifolia*, with smaller amounts of *Cladophora* species. The shaded stream sites were essentially similar to those of the Great Eau, although the exception was that arising from the pool downstream of Maltby Springs (TF313840) where the narrow and fast-flowing channel is bryophyte-dominated (*Amblystegium riparium*, *Rhynchostegium riparioides*, *Aneura pinguis*, *Pellia endiviifolia*, *Cratoneuron filicinum*) with some *Myosotis scorpioides* and *Carex acutiformis*. The vegetation of the open stream sites was similar to that of the Great Eau; in addition some *Mimulus guttatus* was noted at one site with frequent *Callitriche stagnalis*, and *Fontinalis antipyretica* occurred at Hubbard's Hills. The ditch site was dominated by *Epilobium hirsutum*.

Upper River Rase Sites
The four sites on the upper River Rase lie on three separate headwaters and are all located close together in the vicinity of Bully Hills Farm north-east of Tealby, below the crest of the Wolds. The sites comprise one length of small ditch, two stretches of small marshy cattle-grazed and poached stream, and one wooded series of springs with a small stream.

The well-defined springs supported dense *Cratoneuron filicinum*, *Cratoneuron commutatum*, *Aneura pinguis*, *Pellia endiviifolia* and *Conocephalum conicum*, with frequent *Chrysosplenium oppositifolium*. The bryophytes were tufa-forming and the stream arising from the springs was of similar character for a short distance downstream before becoming dominated by *Epilobium hirsutum*, *Ranunculus repens*, *Scrophularia auriculata* and *Chrysosplenium oppositifolium*. The ditch site had a flora somewhat similar to the open stream sites of the other catchments, and *Epilobium hirsutum* was abundant. The flora of the marshy stream sites closely resembled that of the adjacent wetlands: the channels supported locally abundant *Agrostis stolonifera*, *Glyceria fluitans*, *Apium nodiflorum*, *Veronica beccabunga*, *Rorippa nasturtium-aquaticum* and *Carex acutiformis*, and the margins included many wetland plants, among which were *Caltha palustris*, *Cardamine pratensis*, *Cirsium palustre*, *Equisetum fluviatile*, *Galium palustre*, *Hypericum tetrapterum*, *Juncus articulatus*, *Lychnis flos-cuculi*, *Brachythecium rivulare*, *Calliergon cuspidatum*, *Chrysosplenium oppositifolium*, *Epilobium parviflorum*, *Lotus pedunculatus*, *Ranunculus flammula*, *Stellaria uliginosa*, *Cratoneuron filicinum*, *Pellia endiviifolia* and *Aneura pinguis*.

Upper Waithe Beck Sites
The 16 sites on the upper Waithe Beck lie on 10 separate headwaters and are located in the area roughly defined by Stainton-le-Vale-Binbrook-Ludford-Kirmond-le-Mire. The sites comprise small streams (9 sites) and springs/seepage-fed small pools with streams (5 sites) (and 2 sites scheduled for survey which were no longer in existence).

The well-defined springs are dominated by *Cratoneuron filicinum*, *Aneura pinguis*, *Pellia endiviifolia*, *Brachythecium rivulare*, *Conocephalum conicum* and *Rhynchostegium riparioides*, with local abundance of *Cratoneuron commutatum*, and occasional plants of *Barbula tophacea* and *Fissidens crassipes*. At Lud's Well (TF175938) (plate 7), the springs' flow is reinforced by that of seepages, and together the water flows over small waterfalls which support *Rhynchostegium riparioides*, *Cratoneuron commutatum*, *Cratoneuron filicinum*, *Pellia endiviifolia* and *Rhizomnium punctatum*. Seepages have a mixed flora of bryophytes and a few characteristic higher plants, including *Agrostis stolonifera*, *Ranunculus repens*, *Caltha palustris*, *Stellaria uliginosa*, *Poa trivialis*, *Cardamine flexuosa*, *Filipendula ulmaria* and *Ajuga reptans*. The vegetation of the open stream and ditch-like sites is somewhat similar to that of the Great Eau sites; in addition one stretch supported *Callitriche stagnalis* and sparse *Potamogeton berchtoldii*, and another stretch running through marshes supported a diverse flora which included *Carex acutiformis*, *Carex disticha*, *Cirsium palustre*, *Juncus articulatus*, *Juncus subnodulosus*, *Valeriana dioica*, *Calliergon cuspidatum*, *Caltha palustris*, *Galium uliginosum*, *Geum rivale*, *Hypericum tetrapterum* and *Lychnis flos-cuculi*. The shaded stream sites had a sparse and limited flora, in which *Epilobium hirsutum* was a prominent member.

Upper Thoresway Beck Sites
The five sites on the upper Thoresway Beck lie on four separate headwaters between Thoresway and Croxby. The sites comprise three stretches of small ditch-like stream, one

spring-fed pool and one series of springs with a discharge stream and wetland area.

The well-defined springs have a bryophyte-dominated flora of *Aneura pinguis*, *Rhynchostegium riparioides*, *Pellia endiviifolia*, *Cratoneuron filicinum* and *Fissidens crassipes*. Seepages support *Cratoneuron filicinum*, *Ranunculus repens*, *Agrostis stolonifera*, *Brachythecium rivulare*, *Juncus articulatus*, *Aneura pinguis*, *Rorippa nasturtium-aquaticum* and *Veronica beccabunga*. The open ditch-like sites have a flora in which *Glyceria fluitans* and *Epilobium hirsutum* are locally dominant, associated with many other wetland plants as commonly encountered in other catchments. In the wetland below Croxby Spring (TF177973) there was an extensive and diverse flora including carpets of *Aneura pinguis* with *Hippuris vulgaris*, *Berula erecta*, *Equisetum fluviatile*, *Juncus inflexus*, *Juncus articulatus*, *Cratoneuron filicinum*, *Pellia endiviifolia*, *Cratoneuron commutatum*, *Filipendula ulmaria* and *Hypericum tetrapterum*.

Results of Aquatic Macro-invertebrate Surveys

The macro-invertebrate survey sites generally matched those of the botanical survey. In some cases, however, more than one habitat of potential interest was present and in others the available habitat was unsuitable. In addition, the data was augmented by surveys routinely undertaken, over a number of years, at sites further down each catchment. Consequently, although the botanical and invertebrate surveys were broadly similar, there was a small net rise in the number of discrete datasets for macroinvertebrates.

Upper Great Eau Sites

The same nine sites were surveyed for aquatic invertebrates as were surveyed botanically, with additional routine datasets from the lower reaches of Ketsby Beck and the main river at Calceby (where it is known as Calceby Beck). Both of the latter sites comprise fairly large streams, similar to that at Swaby.

The primary areas of interest were the small springs and seepages in the Farforth area, which supported thriving populations of the stenothermic flatworm *Crenobia alpina*. This is more usually associated with upland areas in the north and west of Britain because of its intolerance of high water temperatures, but it can survive in cool spring waters in the east and south, particularly under shade. These springs also supported several other species which are similarly rare or unusual in lowland eastern England, including the caddisflies *Plectrocnemia geniculata*, *Crunoecia irrorata* and *Beraea maurus*, the stoneflies *Nemoura erratica* and *Nemurella picteti* (which also prefers cooler waters) and the blackfly *Simulium costatum*. All of these are associated with flowing waters close to spring heads, often in association with root complexes and extensive vegetation.

Crenobia alpina was also abundant in the well-defined spring system at Belleau, in addition to a single specimen of *Phagocata vitta*. The latter is also a stenothermic flatworm, but is even more sensitive to rising temperatures than *Crenobia*, and is therefore a genuine rarity in the lowlands. The site also supported *Plectrocnemia geniculata*, *Nemurella picteti*, and *Simulium costatum* and the locally scarce water boatman *Hesperocorixa linnei*.

Species in the five stretches of small stream included *Crunoecia irrorata*, *Nemoura erratica*, *Nemoura avicularis*, *Leuctra fusca*, *Centroptilum luteolum*, *Sialis fuliginosa* and *Riolus subviolaceus* in Ketsby Beck, *Simulium costatum* in South Ormsby Beck, *Nemoura avicularis*, *Sialis fuliginosa* and *Simulium lundstromi* in Cloven Hill Beck, near Brinkhill and *Nemoura* *erratica*, *Taeniopteryx nebulosa* and *Leuctra fusca* in Brinkhill Beck. None of these species are genuine rarities, with the exception of *Riolus*, a riffle beetle classed as Nationally Notable (B) and present in the lower reaches of Ketsby Beck. All are somewhat restricted in distribution, however, and infrequently found in Lincolnshire. *Sialis fuliginosa* is of particular interest, being a species of alderfly associated with calcareous, swiftly-flowing water, unlike the very common *S. lutaria*, which prefers depositing substrata and stillwaters over a range of chemical conditions. Likewise, the mayfly *Centroptilum* has rather strict requirements, being associated largely with flowing waters over sandy substrata.

Of the larger streams, the main river (Calceby Beck) supported, *Crenobia alpina* (a single specimen, probably washed-down in high flows from a local spring head), *Taeniopteryx nebulosa*, *Nemoura avicularis* and *Sialis fuliginosa*. There is also an old record of the Nationally Notable caddisfly *Metalype fragilis* from here.

Burwell Beck at Swaby Valley supported a disappointingly low diversity of only common species. This is almost certainly the result of reduced water quality due to one or more discharges from upstream - an issue which needs resolution in the near future.

With the exception of Burwell Beck, all of the upper Great Eau supported a rich and diverse aquatic invertebrate fauna, characterised largely by assemblages of mayflies, stoneflies and caddisflies. In addition to those listed above, these included the common species: *Ephemera danica*, *Paraleptophlebia submarginata*, *Ephemerella ignita*, *Baetis rhodani*, *Isoperla grammatica*, *Sericostoma personatum*, *Silo pallipes*, *Potamophylax latipennis, Potamophylax cingulatus, Micropterna lateralis, Halesus radiatus, Drusus annulatus, Limnephilus lunatus, Rhyacophila dorsalis*, *Lype reducta*, *Plectrocnemia conspersa*, *Hydropsyche siltalai* and *Hydropsyche pellucidula*. Shrimps *(Gammarus pulex*) and riffle beetles (*Elmis aenea*) were common throughout.

Upper River Lud Sites

Two of the sites surveyed botanically (in the Withcall area) were not surveyed for invertebrates, for the reasons outlined above, but data from two sites were added from the routine dataset, taken from the tributary rising near Welton-le-Wold and main Lud, just upstream of Louth. In other cases, the two surveys are matched.

The well-defined spring system rising in Black Plantation, north of Withcall, supported thriving populations of *Crenobia alpina* and *Plectrocnemia geniculata*, as well as *Sialis fuliginosa*, *Nemurella picteti*, *Nemoura avicularis* and *Nemoura erratica*. These springs fed into a small stream in its middle course, in which the latter was also present, as well as the nationally scarce stonefly *Amphinemura standfussi* and more common *Leuctra fusca*. A Nationally Notable (b) scavenger beetle *Hydraena nigrita*, was also inhabiting the main stream. This community appears to be influenced, for the most part, by the high proportion of cool groundwaters in the surface flow and its location in an unmanaged, mixed plantation, which results in heavy shading and much twiggy detritus on the stream bed. The second spring site at Maltby also supported the spring-head specialists *Plectrocnemia geniculata, Nemurella picteti* and *Simulium costatum*, but, surprisingly, no population of *Crenobia alpina*. The reason for this is uncertain.

Nemurella picteti was also present in the South Branch of the Lud at its confluence with the outflow stream from Maltby Springs. There was, however, little else of note in the main river.

This was also true of the Lud at Tathwell, where the fauna seemed to be heavily impacted by sewage discharges and other potential stresses on water quality, and further downstream at Hubbard's Hills, where species diversity was quite high, but all resident species were common.

The North Branch of the Lud supported a more unusual fauna, including *Nemoura erratica*, *Amphinemura sulcicollis*, *Glyphotaelius pellucidus* and *Simulium lundstromi*. The river was surprisingly diverse, given that the upper reaches of the North Lud are dry for much of the time. The nearby Welton tributary, on the other hand, has a virtually constant flow, and therefore supported a fauna which, though unexceptional, included a high abundance of flow-dependant species, such as the very common caddisfly *Agapetus fuscipes*. This species characterises much of the Lud catchment, being present at virtually all of the survey sites, often in high abundance, particularly in the upper reaches.

Downstream of the confluence of the North and South Lud on the Western edge of Louth, the river, though larger, maintains a similar habitat structure to the two upstream branches. Faunal diversity was markedly higher, however, with several rare or unusual species having colonised the site. These included the Nationally Notable (b) riffle beetle *Riolus subviolaceus*, plus *Taeniopteryx nebulosa, Nemoura avicularis* and an unconfirmed record of the caddisfly *Hydropsyche instabilis*. Common species at this site (reflecting the species list throughout the upper catchment) included shrimps *Gammarus pulex*, caddisflies *Rhyacophila dorsalis*, *Lype reducta*, *Polycentropus flavomaculatus*, *Hydropsyche siltalai*, *Hydropsyche pellucidula*, *Silo pallipes*, *Sericostoma personatum*, *Potamophylax latipennis*, *Halesus radiatus* and *Ithytrichia* (*lamellaris*?), mayflies *Ephemerella ignita*, *Baetis rhodani* and *Paraleptophlebia submarginata* and beetles *Oreodytes sanmarkii*, *Brychius elevatus*, *Elmis aenea*, *Limnius volckmari* and *Orectochilus villosus*. The latter is, interestingly, a whirligig beetle which favours riffle habitats.

Upper River Rase Sites

Two of the three headwaters which were surveyed botanically (the small ditch and one of the cattle poached streams) were not surveyed for invertebrates, as the habitat was considered to have little potential. The third headwater (the wooded series of springs) was, however, surveyed extensively, with material taken from three distinct areas (the two upper springs, representing the primary source of the Rase, the lower series of springs and the main stream, formed by the confluence of the whole complex). In addition, a spring source rising immediately below Bully Hill Farm was surveyed, as well as the adjacent lower stream site. Long-term data from a routine site on the B1203 was also available.

The upper spring system (Churn Water Heads) supported a very large and extensive population of *Crenobia alpina*, which, unusually, extended well downstream of the spring heads. This probably resulted from a combination of the large volume of cooled groundwater available and the dense shading of the surrounding woodland, maintaining year-round low temperatures which favours this species. Other species of note throughout the system included *Plectrocnemia geniculata*, *Crunoecia irrorata*, *Beraea maurus*, *Nemoura erratica* and *Simulium costatum*. In addition, the spring heads supported the Nationally Notable cranefly *Dactylolabis transversa*, a species considered to have a more northerly and westerly distribution than Lincolnshire, but associated with moist, sheltered valley woods such as this (Falk, 1992). The larvae were almost certainly obtained from the vertical chalk faces (which they favour) at the back of the springs. This is probably the most south-easterly occurrence of this species in Britain.

Crenobia was also present in the spring at Bully Hill Farm, but in relatively low numbers. The spring was much more open than those upstream, and probably subject to warming by the sun, so that the dominant flatworm was *Polycelis felina*, a much more common headstream species with more catholic habitat requirements. Also present here were *Nemoura erratica*, *Crunoecia irrorata*, *Beraea maurus*, *Simulium costatum*, *Simulium lundstromi* and *Simulium trifasciatum*. The latter is closely associated with calcareous springs in lowland areas (Bass, 1998) but does not seem to be common in Lincolnshire. *S. trifasciatum* was also present in the main stream near to the confluence with the spring-feed. The main stream (representing the main channel of the upper Rase) also supported *Nemurella picteti*, *Nemoura erratica* and *Crunoecia irrorata*.

The site on the upper Rase at the B1203 supports a fauna of potentially national importance. Species present in 2000/2001 included the Nationally Scarce stonefly *Amphinemura standfussi*, described as a cold water species of the upper reaches of watercourses (Bratton, 1990) and *Wormaldia occipitalis*, a caddisfly normally associated with upland torrents, and therefore of very restricted distribution in lowland eastern England, plus the Nationally Scarce (B) riffle beetle *Riolus subviolaceus*. Previous records at the site include the stonefly *Brachyptera risi* (Terry Langford, pers. comm). This is the only Lincolnshire site where this species has been found, although it now appears to be extinct here. The site has also supported the Nationally Scarce caddisflies *Rhyacophila septentrionis* and *Tinodes unicolor* (the latter favours highly calcareous waters, depositing travertine), a second species of *Wormaldia* (*W. subnigra*), *Crunoecia irrorata*, *Taeniopteryx nebulosa*, *Leuctra fusca* (the latter three were present in 2000) and *Sialis fuliginosa*.

The upper Rase has suffered somewhat over the last 20 years or so, through siltation and habitat change due to impoundment for fishing ponds, exacerbated by increasing pressure on the aquifer for water. This led to the apparent loss of *Wormaldia* from the system in the late 1980's through to the mid 1990's (when the genus was rediscovered, there had been a species shift from *W.subnigra* to *W. occipitalis*) and probably explains the likely extinction of *Brachyptera risi* in Lincolnshire. Nevertheless, the upper Rase system continues to support a rich and diverse aquatic fauna. Common species present include *Agapetus fuscipes*, *Rhyacophila dorsalis*, *Sericostoma personatum*, *Micropterna sequax*, *Isoperla grammatica*, *Ephemerella ignita*, *Ephemera danica*, *Baetis rhodani*, *Elmis aenea* and *Gammarus pulex*.

Upper Waithe Beck Sites

The 16 sites surveyed for macroinverebrates virtually matched those surveyed botanically; one, at Binbrook, was disregarded, and datasets from three additional routine survey sites on the main Beck (at Kirmond-le-Mire, Swinhope and Thorganby) were added to the assessment of the system.

The springs rising near Thorpe-le-Vale supported a fauna including *Crenobia alpina*, *Nemoura erratica*, *Nemurella picteti*, *Plectrocnemia geniculata*, *Crunoecia irrorata* and *Beraea maurus* (the latter extending its distribution into the small stream below the spring). In addition, a single specimen of *Phagocata vitta* was found at one of them (Adam's Head Spring). This flatworm, described as "the species most typical of cavernicolous streams in Britain" (Reynoldson & Young, 2000) has only been confirmed from one other surface water in Lincolnshire (Belleau Springs on the Great Eau, see above) and is a regional rarity above ground.

The springs and spring-fed streams in the Kirmond Top area supported all of the above (apart from *Phagocata*), as well as *Simulium costatum* and *Simulium lundstromi*. All were in high abundance, representing a strong and important population of these species. In addition, the spring fed stream flowing through a small wood at Far Dickey Crook supported the regionally rare upland caddisfly *Wormaldia occipitalis*. This species was also present in the springs near Stainton Hall and has been found historically in Waithe (Orford) Beck at Kirmond-le-Mire, several kilometres downstream.

Similar trends continued throughout the springs and spring-fed streams in upper Waithe Beck, with populations of all the above species (apart from *Phagocata* and *Wormaldia*) present, in varying abundance, particularly large numbers colonising the well-defined spring known as Lud's Well. This site also supported the subterranean shrimp *Niphargus aquilex*, a species only occasionally encountered in surface waters.

Other species of note included *Sialis fuliginosa* in the larger stream near Stainton. This species is also known to colonise the main Beck at Kirmond-le-Mire, as are the Nationally Notable *Rhyacophila septentrionis*, *Tinodes unicolor* and *Riolus subviolaceus* and nationally scarce *Amphinemura standfussi*. *R. septentrionis* and *Riolus* have also been found further downstream at Swinhope and Thorganby. All three main Beck sites support *Nemoura avicularis* and a single specimen of *Simulium costatum* was found at Swinhope. The latter record is interesting, as the species is never normally found far from a spring source (Bass, 1998).

Common species in the upper Waithe Beck include the usual range of Lincolnshire chalk stream invertebrates, such as *Gammarus pulex*, *Isoperla grammatica*, *Baetis rhodani*, *Ephemera danica*, *Rhyacophila dorsalis*, *Hydropsyche siltalai*, *Sericostoma personatum*, *Limnius volckmari* and *Elmis aenea*. All are present in high abundance, with virtually all sites in the system exhibiting a rich and diverse fauna, reflecting the generally high water quality and good stability of flows.

Thoresway Beck Sites

The macroinvertebrate survey sites matched the botanical ones very closely, with data obtained from one additional spring source (Peter's Spout) and one routine site at Croxby. One of the main beck sites was not surveyed for invertebrates.

All of the spring sources, apart form Peter's Spout, supported small populations of *Crenobia alpina*. Most were also colonised by *Crunoecia irrorata*, *Beraea maurus*, *Nemoura erratica* and *Simulium costatum*. The latter was also present in the main Beck below the confluences of the spring feeds. Particularly noteworthy records were the subterranean shrimp *Niphargus aqulilex*, present in the series of springs near Croxby, and *Apatania muliebris* in the outflow stream from Vale Farm Spring at Thoresway. The latter is a parthenogenetic caddis, of interest because its reproductive strategy leads to distinct genetic and morpholgical differences between populations from different stream sites. It is, moreover, classed as Regionally Notable in eastern England and only occurs close to permanent springs (Wallace, 1991).

The main Beck was rather disappointing, with gross modifications of the habitat resulting in a fairly limited fauna of very common species, such as *Gammarus pulex*, *Agapetus fuscipes*, *Ephemera danica*, *Baetis rhodani* and *Sericostoma personatum*. A locally unusual caddis (*Limnephilus fuscicornis*) was, however, present in the relatively natural channel in the middle reaches.

Plate 1 Tundra-like present day arctic Norway may resemble what Lincolnshire may have been like during the Pleistocene (page 195). photo Roger Key

Plate 2 Evidence of the habitat of Pleistocene mammals comes from deposits such as these at Welton-le-Wold (page 197). photo Neil Pike

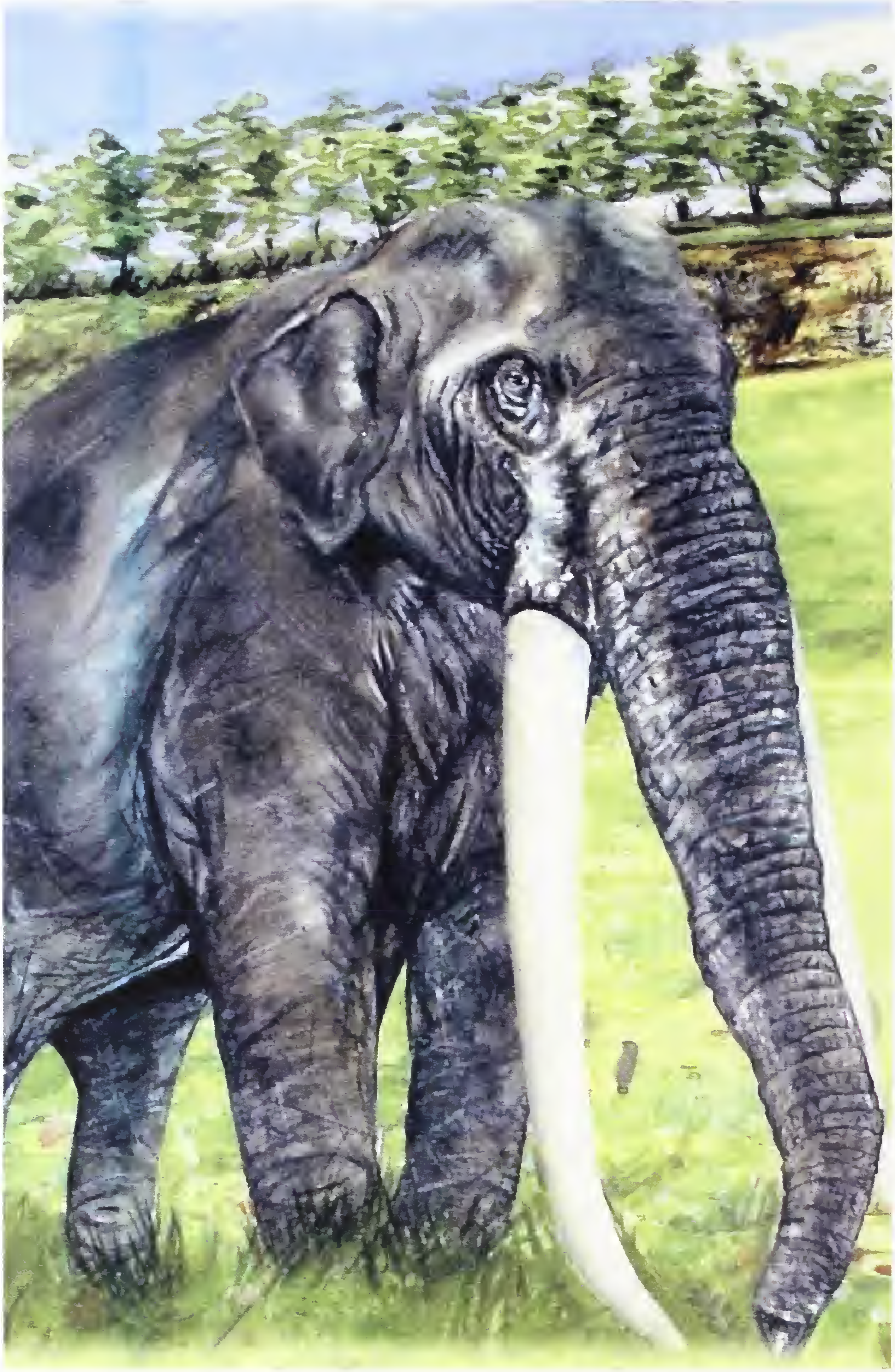


Plate 3 Artist's reconstruction of the straight-tusked elephant *Palaeoloxodon antiquus* found at Deeping St James (pages 201-202) from painting by Sam Ely

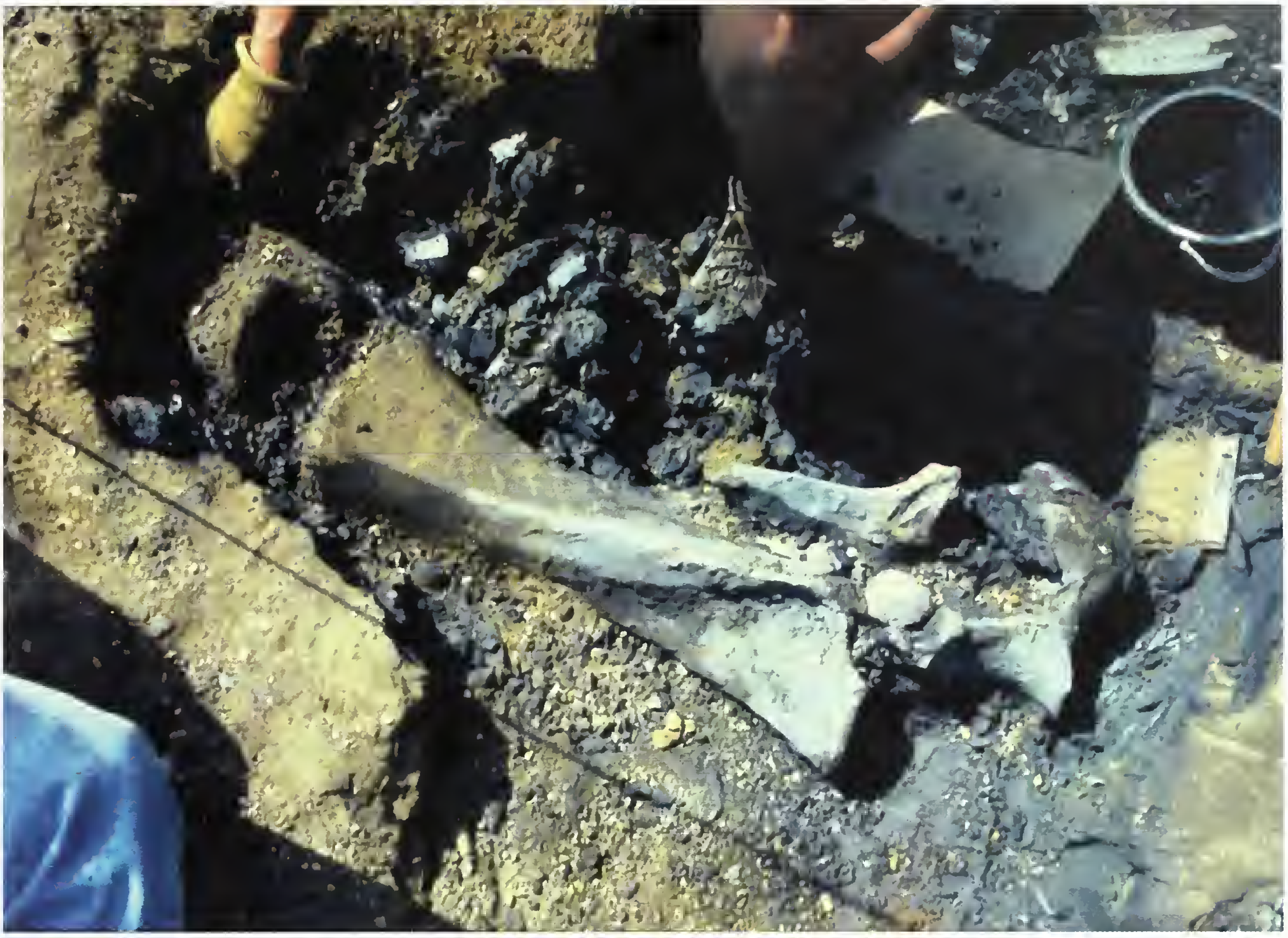


Plate 4 The Deeping elephant leg bone *in situ* during excavation (page 202). photo Alan Dawn

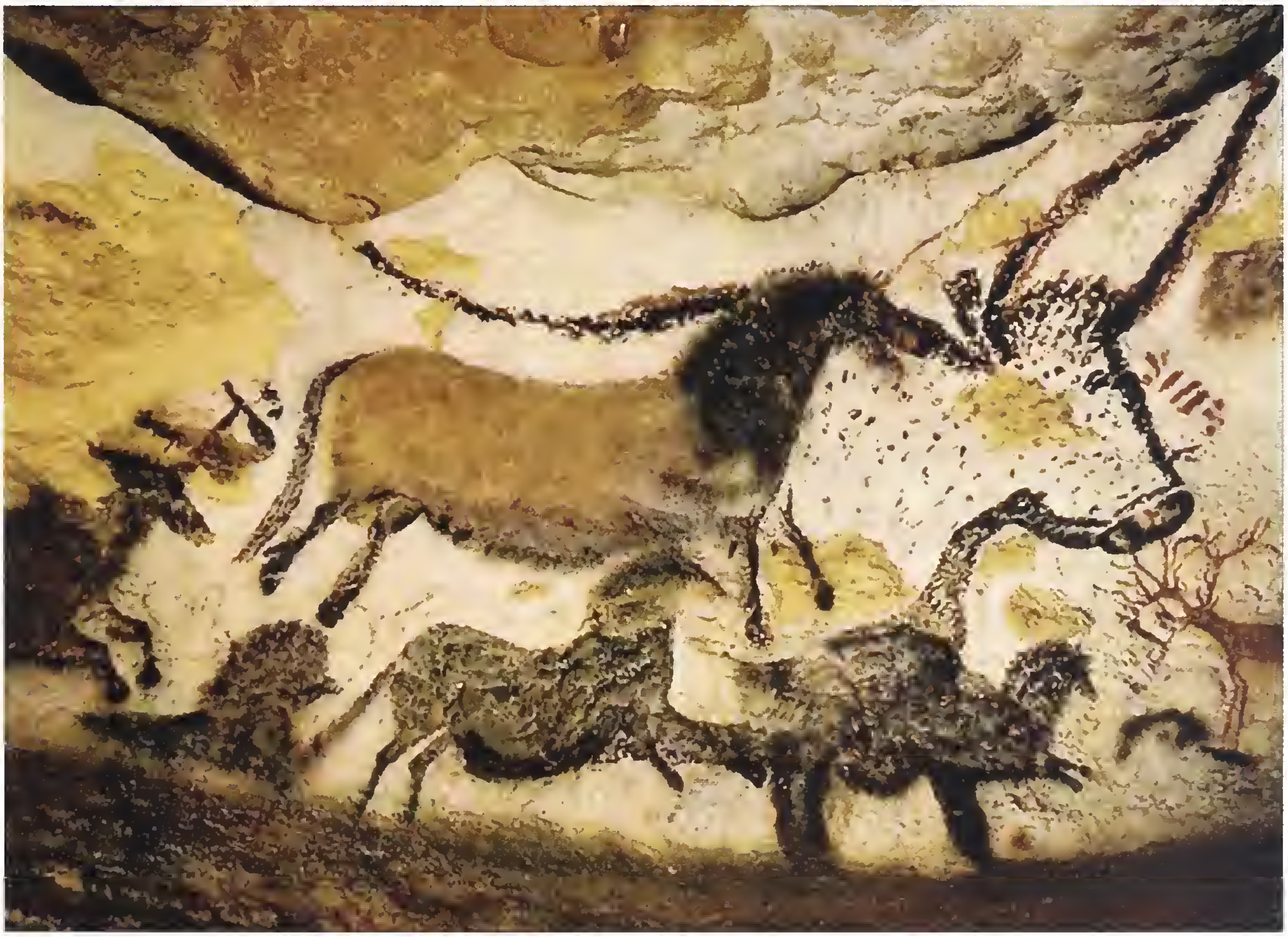


Plate 5 The appearance of many Pleistocene mammals can be deduced from prehistoric cave paintings. Chauvet Cave, France

Plate 6 Lincolnshire's chalk streams support important biodiversity: chalk spring at Belleau Springs (page 213) photo Tim Smith

Plate 7 The tufa-depositing mini-waterfalls at Lud's Well are unique in Lincolnshire and support scarce species. (page 215). photo Tim Smith

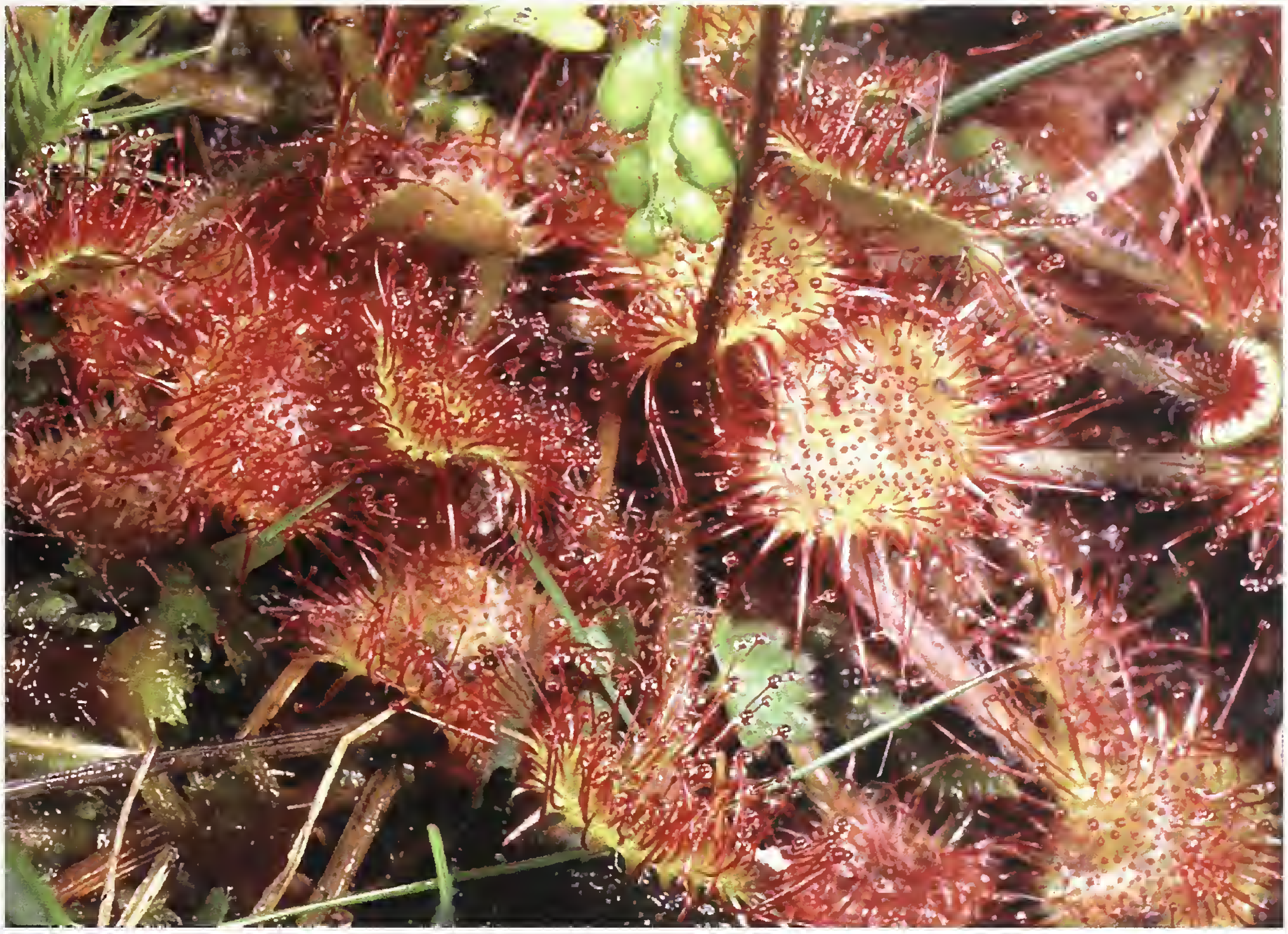


Plate 8 Round-leaved sundew *Drosera rotundifolia* has turned up at Swanholme Lakes after a long absence in South Lincs (page 237). photo Roger Key

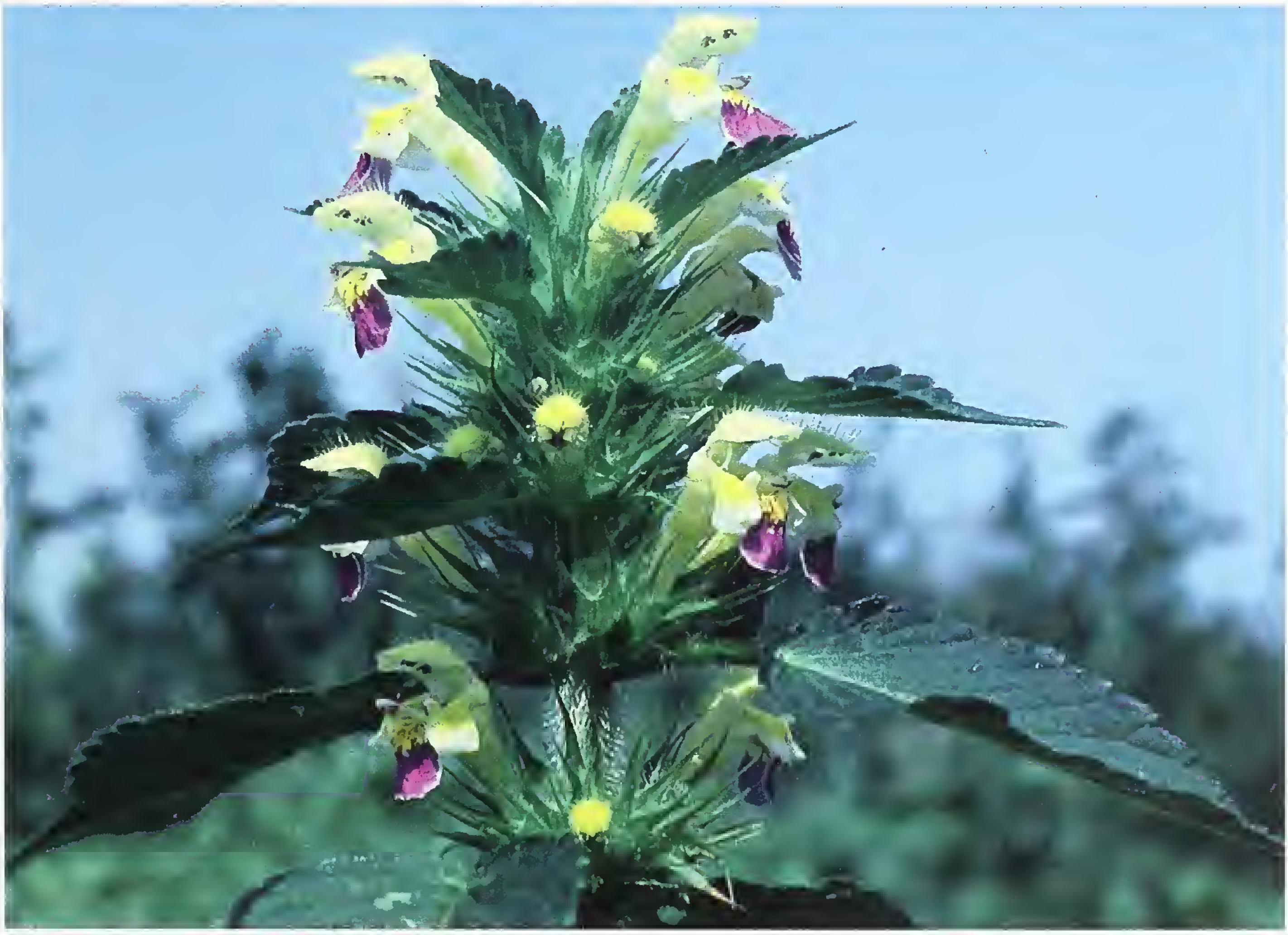


Plate 9 Large flowered hemp-nettle *Galeopsis speciosa* turned up at Ostler's Plantation (page 239). photo Irene Weston

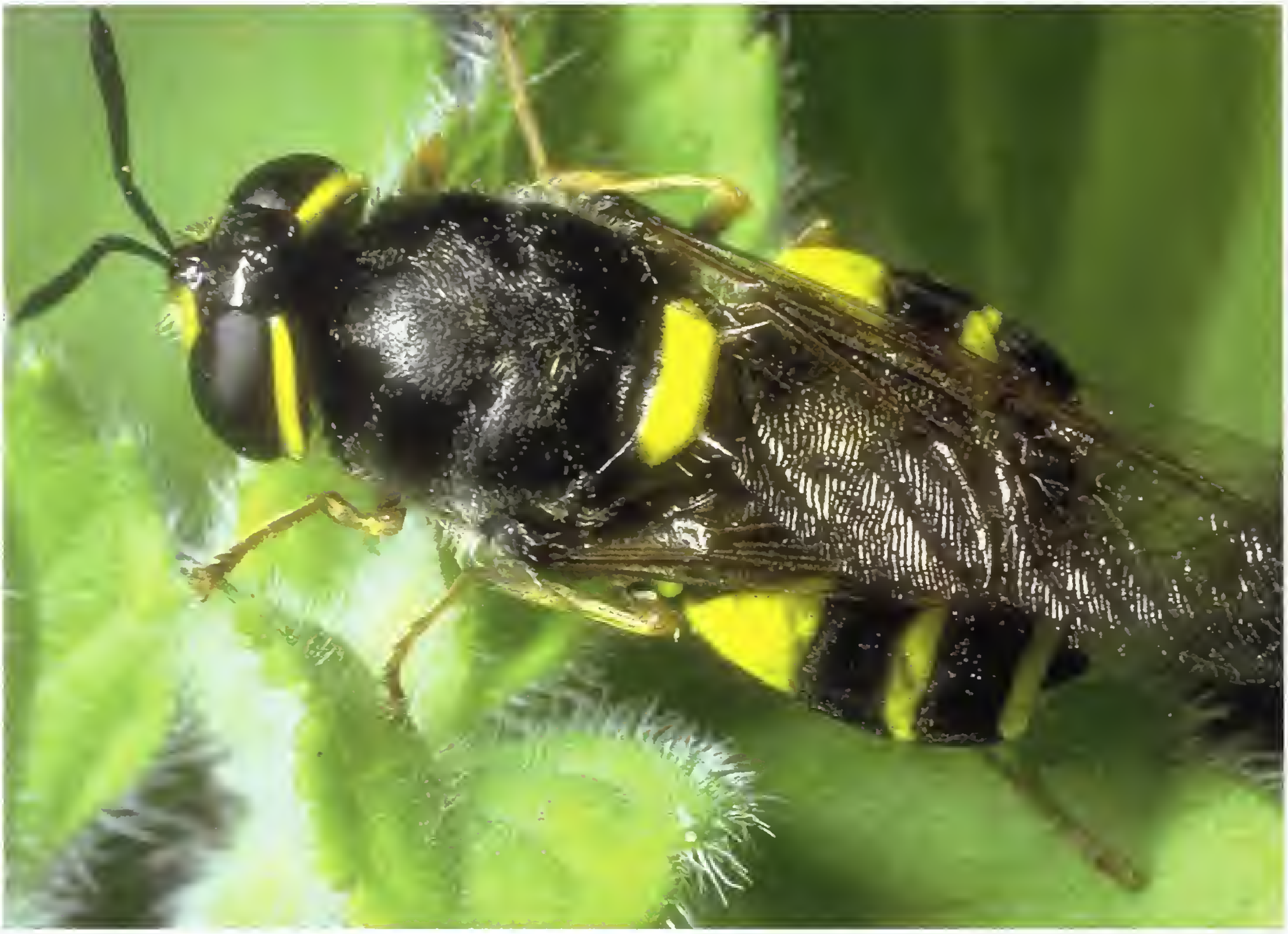


Plate 10 The soldier-fly *Stratiomys potamida* from Snakeholme Pit, only the fourth Lincolnshire record. (page 240). photo Roger Key

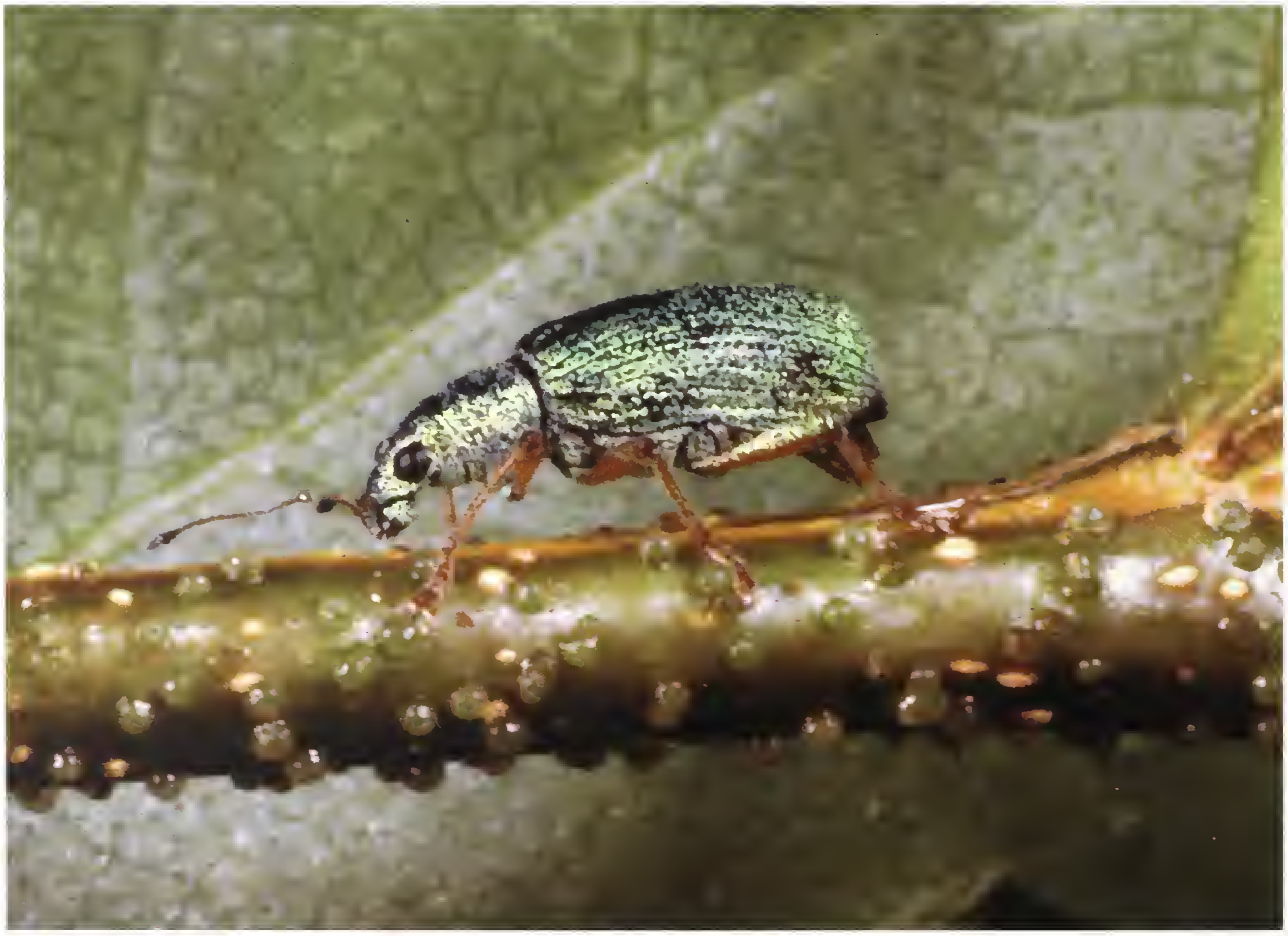


Plate 11 The broad-nosed weevil *Polydrusus pulchellus* turned up new to Lincolnshire in Lincoln (page 242). It is known to be spreading. photo Roger Key

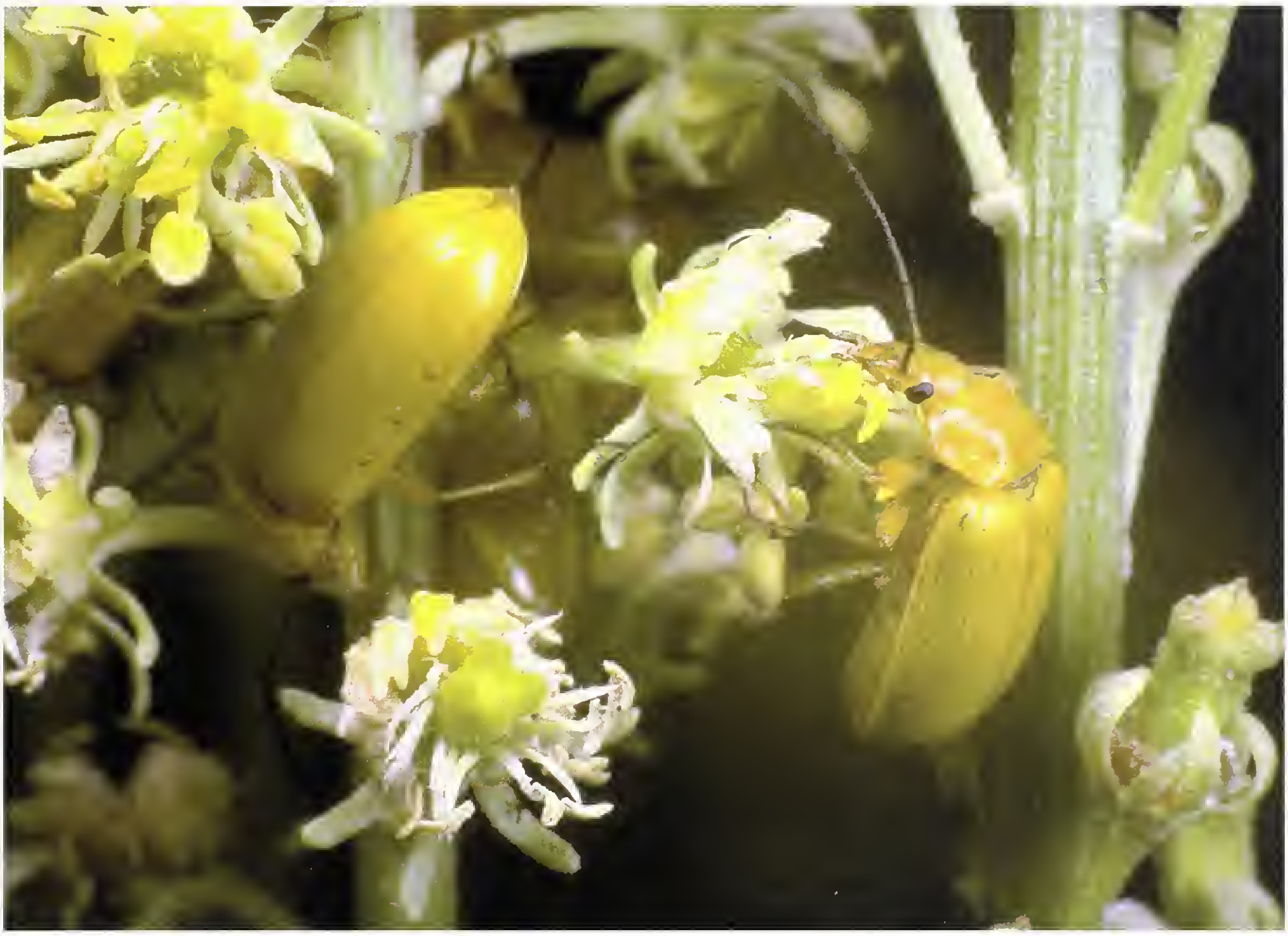


Plate 12 Sulphur beetle *Cteniopus sulphureus* was found on the Lincolnshire coast for the first time on the Wash (page 244). photo Roger Key

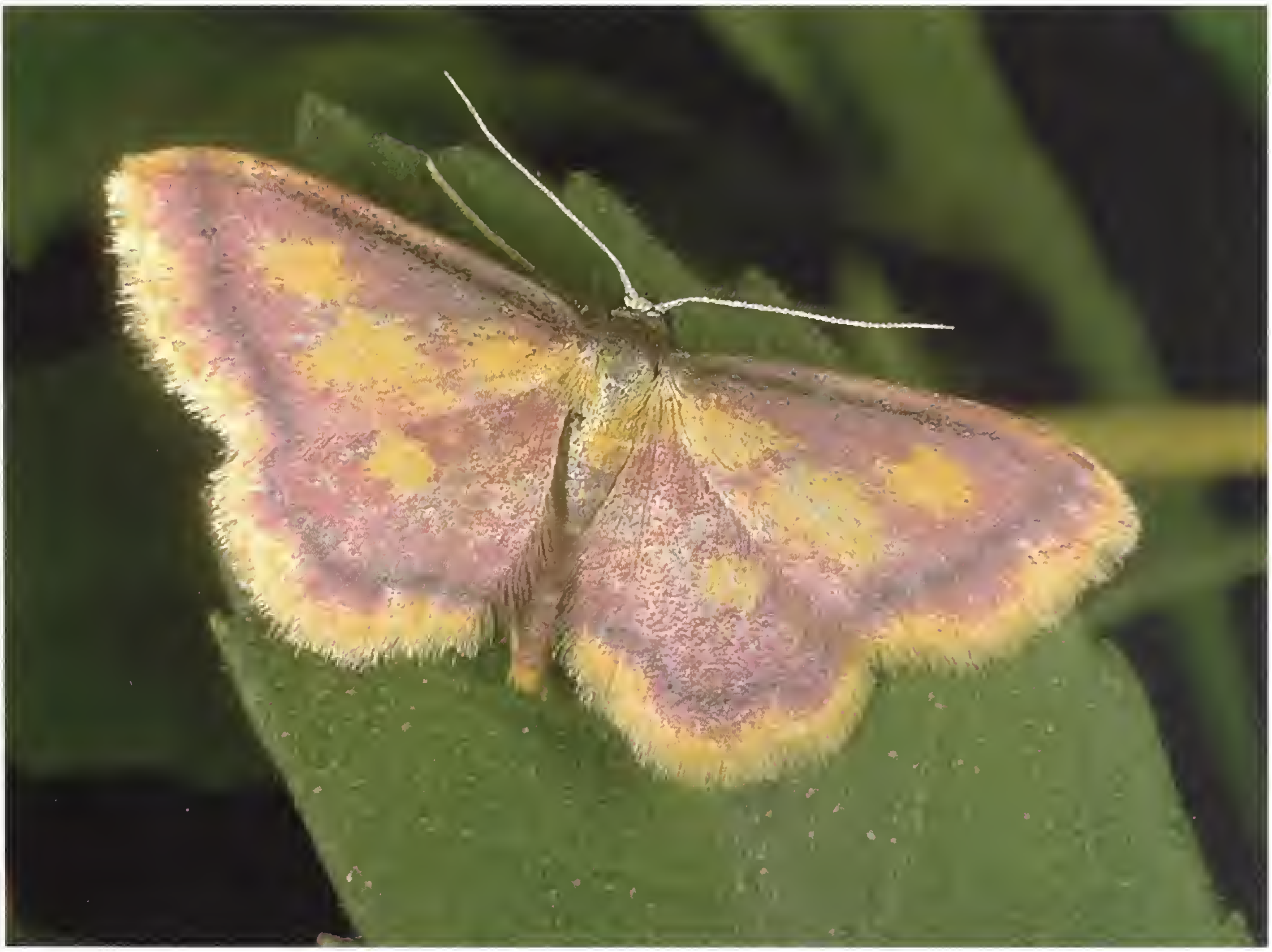


Plate 13 The purple-bordered gold *Idaea muricata* turned up at Haugham in July (page 247). Photo Roger Key

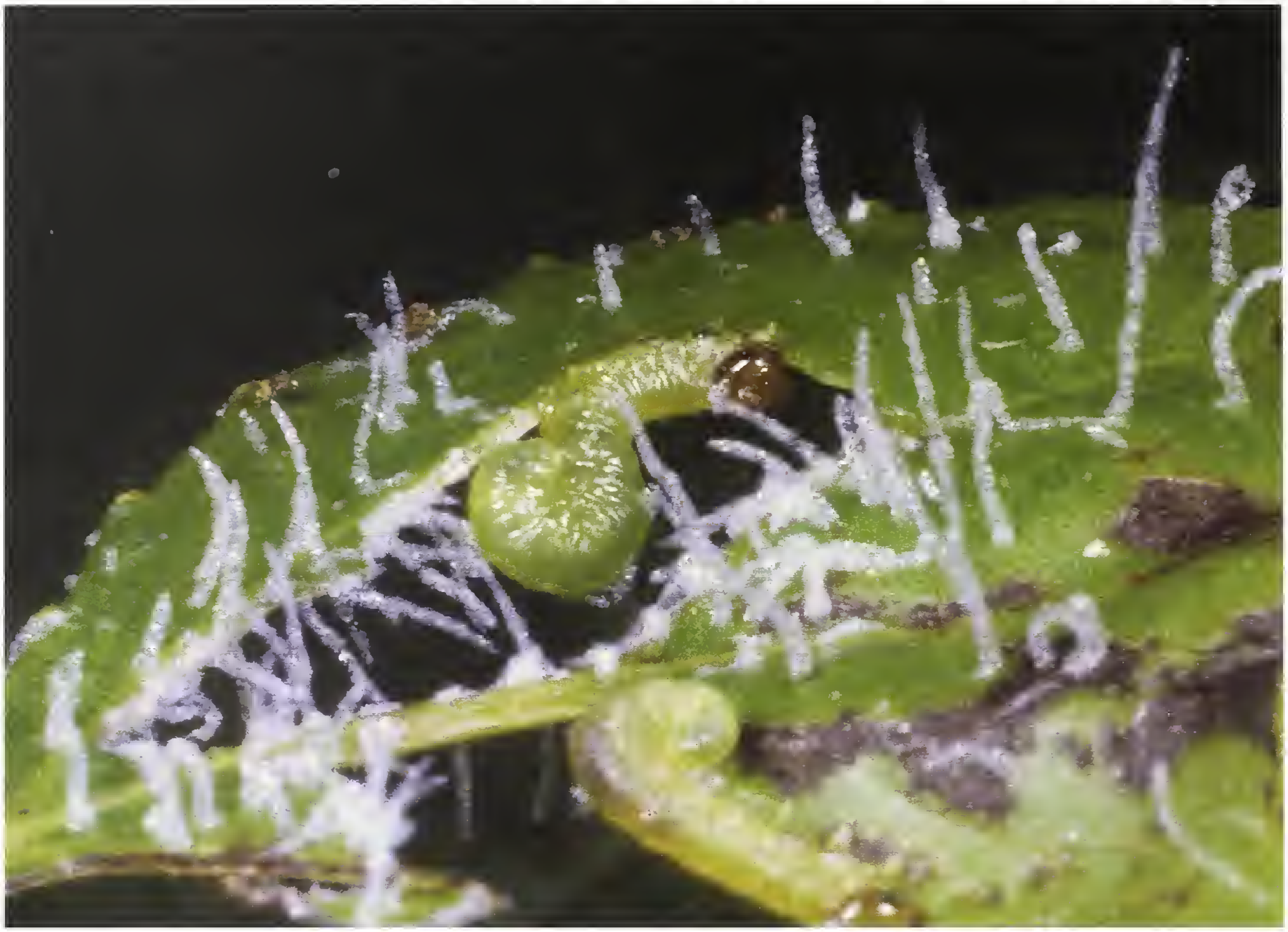


Plate 14 Larvae of the sawfly *Stauronematus compressicornis* with its 'palisade' of saliva columns to ward off predators (page 248). photo Roger Key

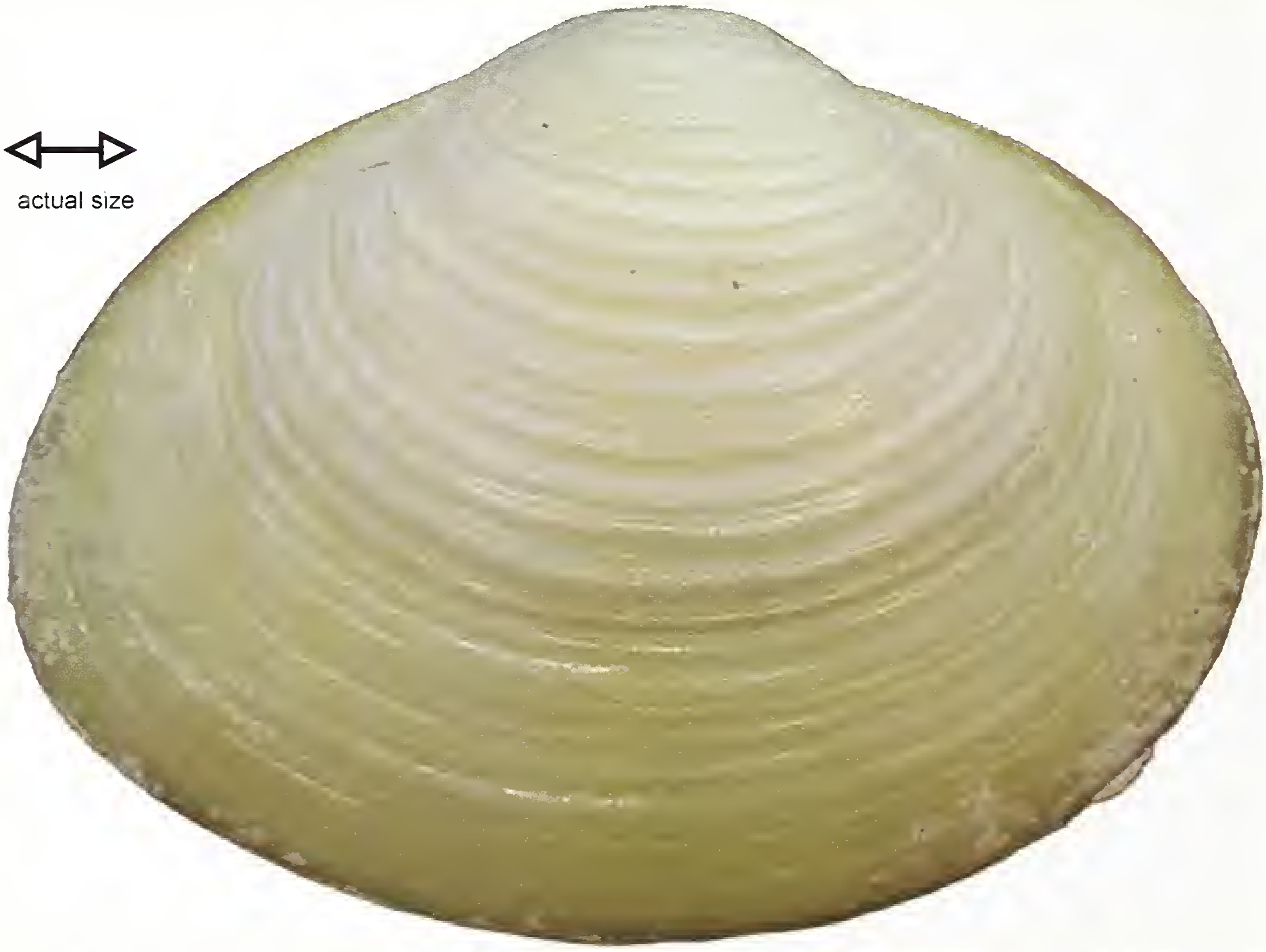


Plate 15 Witham orb mussel *Sphaerium solidum* is a national RDB species, found again in 2002 (page 251). Photo by kind permission of The National Museum of Wales

Conclusions

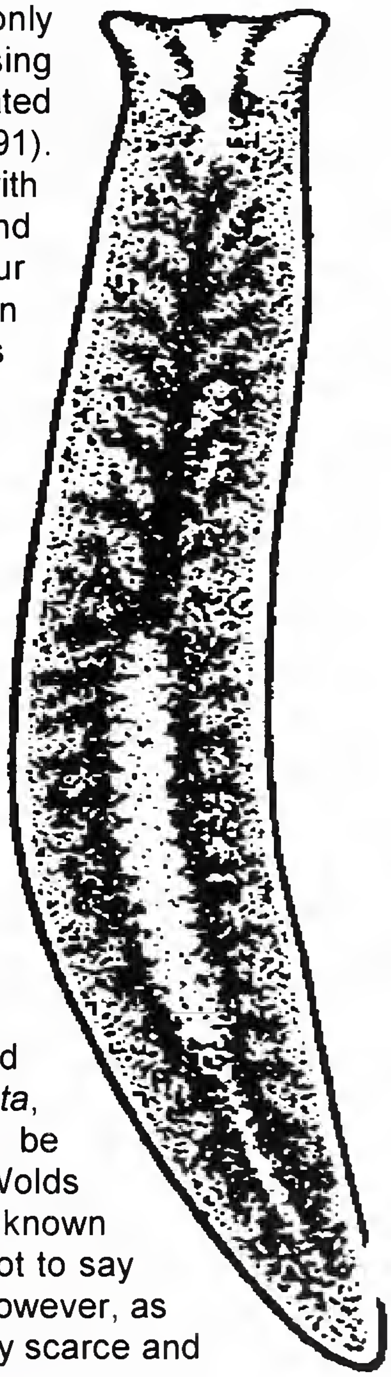
The habitat and botanical studies undertaken in 2000 by ESL on behalf of the Agency's Lincolnshire Chalk Streams Project have dramatically increased the amount of knowledge on the nature of the chalk springs, headwaters and streams of the Lincolnshire Wolds. Prior to this study, little was known about the botanical interest of these habitats. Such information available was incomplete, scattered, lacked any analysis and conclusions, and more than likely it was old (Farrow & Wright, 2000). Now, with this work, a significant step has been taken to meet the national (and local) Habitat Action Plan target which requires the collection of biological data on chalk rivers which have a paucity of, or lack, information. Specifically, the 2000 habitat and botanical studies have provided the following:

New plant community information.

The bryophyte-dominated vegetation of the spring-heads (and some short reaches of watercourse immediately below these sources) has never before been identified and described in Lincolnshire, and has received only scant recognition nationally. There is only a very brief and passing mention of lowland springs and their bryophyte-dominated vegetation in the National Vegetation Classification (Rodwell, 1991). This work describes two upland spring vegetation types with constant *Cratoneuron commutatum* and *Cratoneuron filicinum*, and acknowledges that springs dominated by these mosses occur scattered in the lowlands but that "further sampling" is needed in order to fully describe this aspect of British vegetation. There is even less reference to chalk springs and their bryophyte flora in Englis Nature/Environment Agency (1999) and in Holmes *et al* (1999). In Lincolnshire, limited reference is made to "spring-line flushes" in the Wolds in English Nature (1997a) and to "calcareous flushes" with *Cratoneuron commutatum* on the limestone in English Nature (1997b).

Extended known distribution of Scarce species.

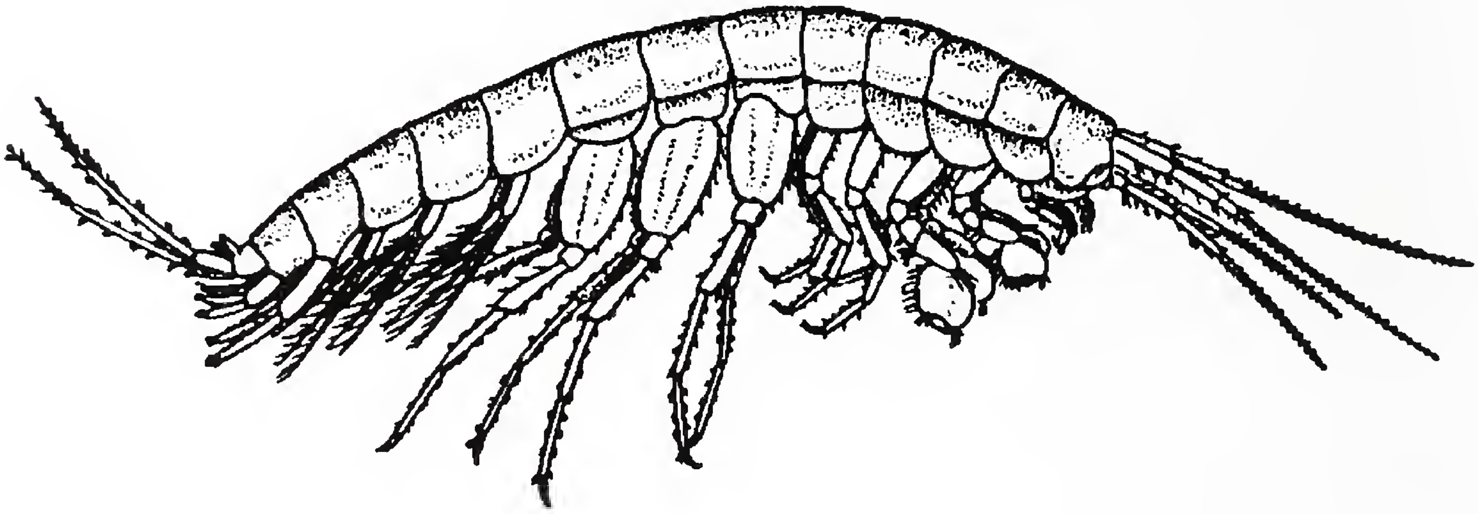
The most important addition to the aquatic invertebrate dataset is the abundance of new sites supporting *Crenobia alpina*, which was previously known only from a handful of sites, such as Belleau and Claxby Springs. Indeed, the latter was, in part, secured as a Wildlife Trust reserve on the basis of the *Crenobia* population. This survey shows that the presence of *Crenobia* in spring heads in the Wolds tends to be the norm, rather than the exception. The same is broadly true of many of the specialist spring head species previously considered to be rather rare in the lowlands, such as *Plectrocnemia geniculata*, *Crunoecia irrorata* and *Nemurella picteti*. It would not be unreasonable to mark all of the 10 km squares which cover the Wolds as likely locations for all four species, where previously the known coverage for *Crenobia*, for example, was only TF47. This is not to say that the populations revealed by this survey are unimportant, however, as undamaged spring head sites in chalk areas remain a relatively scarce and fragile resource.



Crenobia alpina (after Engelhardt, 1964)

Certain species, such as *Phagocata vitta*, *Niphargus aquilex*, *Amphinemura standfussi*, *Apatania muliebris*, *Wormaldia occipitalis*, *W. subnigra*, *Tinodes unicolor*, *Rhyacophila septentrionis* and *Dactylolabis transversa* remain genuine rarities in Lincolnshire, however, and are almost certainly rare throughout lowland eastern England. The latter three are classed as Nationally Scarce (B) species and, in the case of *Dactylolabis*, have not previously been found in this part of the country (Falk, 1992). The confirmation of the larval record with adult material from the head of the Rase is a future priority.

Niphargus aquilex
after (Engelhardt, 1964)



According to the information in Preston & Croft (1997), the record of *Callitriche obtusangula* from Belleau Spring is an extension of the Lincolnshire range of this species, as far as post-1950 records are concerned, into the Wolds from the south-west of the county. The survey has much increased the number of post-1950 10km square records for *Pellia endiviifolia* and *Aneura pinguis*, compared to the information in Hill *et al* (1991). For the former species, new records are made for TF28, 29, 37 & 38, and for the latter for TF19, 28, 29, 37, 38 & 47. There are also new 10km squares for *Brachythecium rivulare* (TF37), *Conocephalum conicum* (TF38), *Cratoneuron commutatum* (TF29), *Cratoneuron filicinum* (TF29, 38), *Fissidens crassipes* (TF19), *Fontinalis antipyretica* (TF38) and *Rhynchostegium riparioides* (TF29, 38), comparing survey data to the information given in Hill *et al* (1991, 1992, 1994).

New locations for tufa formation. The formation of tufa is a small-scale, active geological process which takes place where water which is saturated with lime emerges at a spring or seepage, usually where there is also a dense sward of bryophytes. The growth of the plants somehow mediates the formation of tufa, which encrusts the lower parts of the plants with calcium carbonate, and in time, large masses of material can be formed. Tufa is vulnerable to destruction and the reduction in, or cessation of, spring-flow by over-abstraction of groundwater for example, would have a deleterious effect on the tufa-formation processes. Folk lore accounts of "petrifying springs" refer to tufa formation, and while it is likely that a number of such springs have dried up or been piped, some still remain. Among these can now be numbered the sites Rase 3 (TF 160 924) which is a series of wooded springs; Waithe Beck 2 (TF 159 948) which is a series of springs and seepages; and Waithe Beck 7 (TF 175 938) which is the Lud's Well site where there are springs and small waterfalls formed of tufa, a feature probably unique in the county. The bryophytes involved in tufa formation at these three sites are *Cratoneuron filicinum*, *Cratoneuron commutatum*, *Aneura pinguis*, *Pellia endiviifolia*, *Conocephalum conicum*, *Barbula tophacea* and *Rhynchostegium riparioides*.

The Future

Further habitat, botanical and aquatic macro-invertebrate surveys are proposed for 2002, concentrating in the area between Caistor and Market Rasen (for springs) and in the catchments of Aylesby Beck, Laceby Beck and Waithe Beck (for chalk stream sites). The collection of existing background information on chalk rivers in Lincolnshire runs parallel to the field surveys, and the Agency would like to receive any ecological records, as well as anecdotal information regarding the past or current nature of springs and headwaters in the Lincolnshire Wolds.

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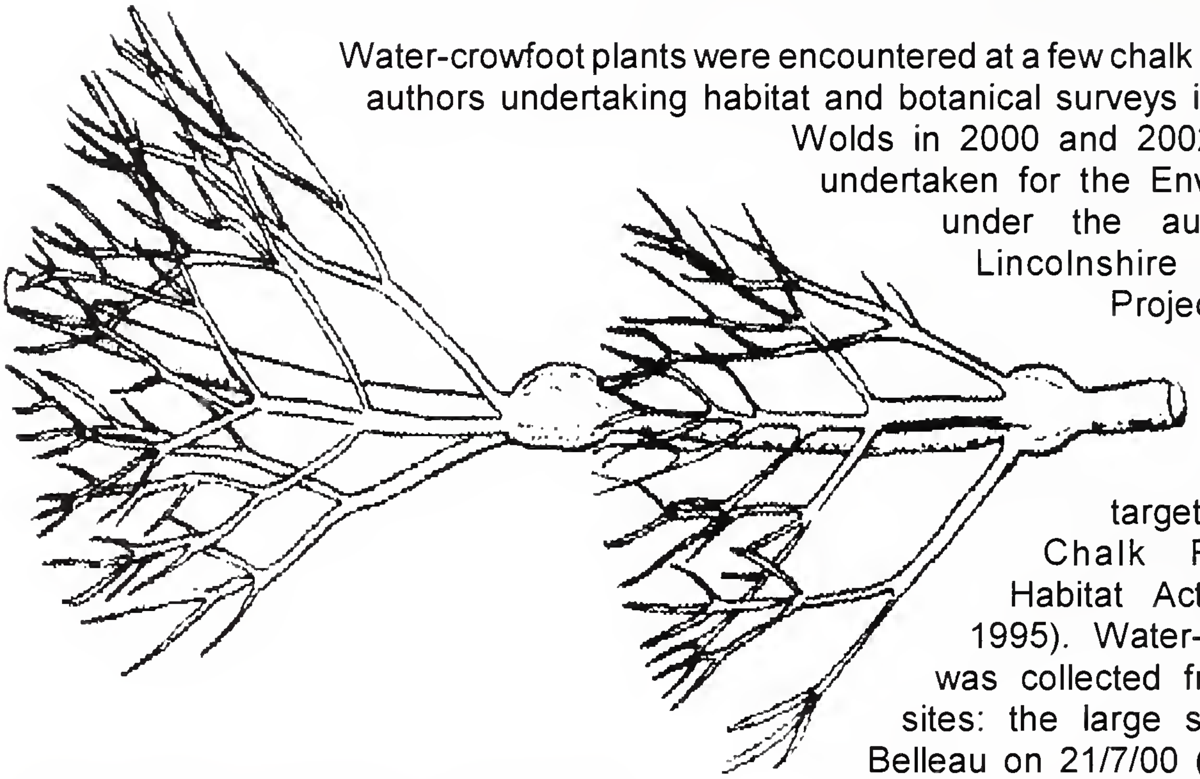
STREAM WATER-CROWFOOT *RANUNCULUS PENICILLATUS* SSP. *PSEUDOFLUITANS* IN NORTH LINCOLNSHIRE CHALK STREAMS

Tim Smith and John Jones

Water-crowfoots *Ranunculus* Sect *Batrachium* have a reputation of being fiendishly difficult, if not impossible, to identify. In part, this is true due to "extreme phenotypic plasticity, morphological reduction and frequent hybridisation" (Webster, in Rich & Rich, 1988), yet in part it is also not true provided adequate mature, typical flowering and fruiting material can be collected since there are now several keys available to determine specimens.

Water-crowfoot plants were encountered at a few chalk stream sites by the authors undertaking habitat and botanical surveys in the Lincolnshire Wolds in 2000 and 2002. This work was undertaken for the Environment Agency under the auspices of their Lincolnshire Chalk Streams Project, which is one of the Agency's local initiatives towards achieving targets given in the Chalk Rivers national Habitat Action Plan (Anon, 1995). Water-crowfoot material was collected from the following sites: the large spring-fed pool at Belleau on 21/7/00 (TF 402 785); the chalk stream which exits this pool and which is a headwater of the Great Eau on 23/5/02 (TF 402 784 – 404 783); from the lower Waithe Beck near Brigsley (TA 253 017) and near Waithe (TA 291 009) both on 11/9/02; and from Laceby Beck downstream of Welbeck Hill Spring on 11/9/02 (TA 227 046). Material from Belleau pool and river and from the Brigsley site was identified as stream water-crowfoot *Ranunculus penicillatus* subsp *pseudofluitans.* Material from the Waithe site and from Laceby Beck could not be identified; in both cases the poor material looked like new growth following flood or cutting damage to old plants and no flowers or fruit were present.



characteristic leaf shape of *Ranunculus pencillatus* ssp *pseudofluitans* (after Haslam et al, 1982)

At Belleau pool the *Ranunculus* was associated with blunt-fruited water-starwort *Callitriche obtusangula*, horned pondweed *Zannichellia palustris*, common duckweed *Lemna minor*, water-cress *Rorippa nasturtium-aquaticum* and the moss *Rhynchostegium riparioides.* In the stream below the pool it was associated with the mosses *Rhynchostegium riparioides* and *Fontinalis antipyretica* and also *Callitriche obtusangula*, fool's water-cress *Apium nodiflorum*, *Rorippa nasturtium-aquaticum*, pink water-speedwell *Veronica catenata*, brooklime *Veronica beccabunga* and water forget-me-not *Myosotis scorpioides.* At the Brigsley site it occurred with *Zannichellia palustris*, *Rhynchostegium riparioides*, blanketweed *Cladophora* sp, *Myosotis scorpioides*, *Veronica beccabunga* and bittersweet *Solanum dulcamara.* At each site therefore the water-crowfoot was associated with some typical chalk stream plants, although the overall community of aquatic and marginal vegetation at each site was not as diverse as that found at classic chalk rivers in southern England (see Holmes *et al*, 1999 and Mainstone, 1999).

Stream water-crowfoot is a rare plant in Lincolnshire. Preston & Croft (1997) show two post-1970 10km records in the southern Wolds (TF47 and TF48) in addition to other post-1970 10km square records for the south-west (TF00, TF01, TF10), possibly from the River Glen and Welland although they may refer to records arising from the River Gwash in Rutland in TF00 and TF01. In the latest Botanical Society of the British Isles plant atlas (Preston *et al*, 2002), records for this species from the two Wolds squares are shown as being made between 1970 and 1986, with those from the south-west being more recent (1987-99). The current records from Belleau pool and spring therefore update the record for TF47 and its discovery in Waithe Beck is a new 10km square record, for TA20. The material from Waithe Beck at Waithe and from Laceby Beck, if identified as *Ranunculus penicillatus* subsp *pseudofluitans*, would not extend the distribution of this species in the county in 10km square terms but it would increase the number of stations in TA20. The outflow stream from Belleau pool does eventually enter TF48 after joining Calceby Beck and passing through Claythorpe, and the reach of Great Eau in TF48 upstream of Withern needs searching for the *Ranunculus* in order to update the record for this square. The TF48 record could also, or alternatively, have been made from the upper reaches of the Long Eau in the vicinity of Little Carlton; this stretch of river therefore also needs searching.

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LINCOLNSHIRE NATURAL HISTORY IN 2002

Another very wet and fairly mild winter, spring and early summer which then turned into almost a drought. Hot dry weather continued well into October and the drought broke suddenly and spectacularly in mid October with heavy rains culminating in a major storm on 27th Oct which nearly rivalled the 1987 hurricane in its ferocity, felling trees throughout the county. The weather then continued very wet and mild through to end of the year with few frosts and standing water in the fields throughout the fens. Globally, it was the 2nd warmest year since records began.

Acknowledgments of Records

As always, the county recorders have acknowledged a debt of gratitude to all who have taken the time and effort, very considerable in some cases, to submit records. There are so many who send in records of different groups of animals and plants that individual recorders are now acknowledged together to avoid duplication: V.Adams, D.Aldridge, A.&A.Binding, I.Birch, J.Bratton, D.Bromwich, A.Brownlow, R.Chadd, P.Chandler, A.Chick, G.Clayton G.&J. Culpitt,J.Davison, C.Dobson, N.Drinkall, C.du Feu, B.Edlington, Environment Agency, C.&A. Faulkner, R.Fox, W.Gilliat, R.Goy, S.Green, H.Gregory, N.Harris, Z.Harris, P.Haywood, G.&J.Heath, K.Heath, B.Hedley, D.Hemingway, A.C.Henderson, D.Holyoak, R.Hook, D.Hughes, J.Jaines, R.&R.Key, I.Killeen, P.Kirby, D.Knight, R.Labett, J.Lamin, F.Lammiman, A.Lazenby, T.Lee, K.Leighton, T.Ludlow, E.Mackrill, W.Meek, N.Miller, J.Ostler, K.Painter, R.Parsons, J.Pennell, M.Pool, P.Porter, C.Rieser, K.Robertson, N.Skelton, C.Smith, K.Smithers, G.Steele, T.Sykes, G.Taylor Mr Timms, A.Ward, P.Waring, J.Webb, V.Wilkin, M.Willing, K.M Wilson.

FUNGI - Ken Rowland

Dry and wet spells came at the wrong times in 2002, not just in Lincolnshire but all over the country. This resulted in a very slow start to the season and a very late finish, some species still going strong into December. As during last year, some species with mycorrhizal associations, notably *Russula* and *Lactarius* spp did not show up at all well in the dry spells. Overall, however, it was very wet. From my own rainfall records it would appear that we are getting about twice the amount of rain compare with the 1980's - over 800mm, against ca 400mm in the late 1980's

At the Lincolnshire Naturalists Union meeting at Copper Hill on 16th June, only thirteen species were recorded; it was pretty dry and in the middle of the summer, but all are new site records and one, *Hygrocybe konradii,* is a new county record. This is a orange/yellow wax cap that frequents calcareous turf, in this case rabbit-grazed roadside turf. Another new county record during the year was *Mycena renati*, a fairly tall species with a greenish stem, growing on old stumps at Chambers Farm Wood.

The annual fungus foray was at Green Man Wood on 20th October and was somewhat more productive, with seventy-four species being recorded, twenty-nine of which were new to the site. This wood was last visited for recording purposes by Jack Houghton, John Rowe and myself in the mid and late 1980's. John unfortunately died before the meeting took place and I would therefore dedicate this meeting to John's memory.

The one other summer outdoor meeting from which I received records was that at Messingham on 15th September, at which Colin Faulkner recorded 14 species. In addition, I have led about twenty forays at various sites for other groups and, over the whole season, the number of species found has been only about 50% to 60% of what I would have expected in a typical year.

In my monthly survey at Moor Closes Reserve, it was interesting to note that, while following the general trend, some species have been very late in their fruiting, some, notably the wax caps, coming through as late as the second week in December and then very sparsely. The ascomycete *Verpa conica* did appear again in the spring, proving that its hundred year apparent absence before it was seen again last year was probably due to lack of looking and not because it wasn't there. One interesting little fungus there was *Coprinus miser* on a cow pat; part of which I took home and, over a period of a couple of months, over a hundred fruiting bodies appeared. The caps are only about a millimetre or two in diameter and the stem about four or five millimetres high and they only last an hour or so before autodigesting as is the habit of *Coprinus* and fruiting bodies were still appearing in mid February 2003.

Coprinus miser on cow dung. photo K. Rowland

At the end of November I attended the British Mycological Society's group leaders meeting at Keele University and it was interesting to hear the comments from recorders around the whole of the country regarding great scarcity of fungi, which were reiterated in the November issue of the Mycologist. It is interesting that trends do seem to be country wide; last year, when we had *Verpa conica* and *Taphrina pruni,* both species were found in widely different areas for the first time or after long absences so it would seem that we should look at weather conditions and trends much more closely.

Schizophyllum commune
photo K.Rowland

Early in January 2002 I became embroiled with Channel 4 Television. On 26th January the Daily Star had the headline "Killer Fungi Alert" about a brain-eating fungus! Channel 4 picked this up and I received a phone call asking if would I appear on the 'Richard and Judy Show' to which request I politely declined. The fungus in question *Schizophyllum commune,* which seems to have taken a liking to growing on bigbale silage, appeared last year on an old branch at Hartsholme. According to this scare, the whole of Hartsholme Visitors Centre should have been isolated. Alarmist stories like this do not do the mycological world any good at all.

MOSSES, LIVERWORTS AND LICHENS
Mark Seaward

The invaluable work of Frank Lammiman and Christine Rieser provided all of the bryophyte records this year, including a new vice-county record (*Eurhynchium pumilum*) and 15 divisional records as indicated below. The return of several epiphytic species to the county, most not seen for 100 years of more, continues; of particular interest is *Ulota bruchii*, which has now been recorded from 21 sites during the last decade.

Five new county records (*Caloplaca obscurella*, *Chaenotheca chlorella, Enterographa crassa*, *Flavoparmelia soredians*, *Lecanora epanora*), three new vice-county records (*Arthonia radiata*, *Caloplaca ruderum*, *Ochrolechia androgyna*), 59 divisional records and many grid square records were added to our lichen registers in 2002. As a consequence, the county's lichen flora can be summarized as follows:

319 taxa have been recorded from Lincolnshire (306 since 1960), of which 11 have not been seen for more than 100 years and are presumed to be extinct.

A further 56 churches were investigated by the author in 2002 as part of the British Lichen Society's churchyard survey; to date, 365 (54%) of an estimated 676 Church of England churches have so far been researched, as a consequence of which further habitats providing refugia for locally rare (e.g. *Lecanora epanora*) and nationally rare species (e.g. *Ramalina capitata*) have been discovered.

The following moss and liverwort records were all contributed by F.R.Lammiman and C.Rieser and all the lichen records were contributed by the author, who is most grateful to Dr B.J.Coppins, Royal Botanic Garden, Edinburgh, for his identification/confirmation of the more critical lichen material. The nomenclature is according to T.L.Blockeel and D.G.Long (1998) *A Check-list and Census Catalogue of British and Irish Bryophytes* and to B.J.Coppins (2002) *Checklist of Lichens of Great Britain and Ireland.*
NCR = New County Record. VCR = New Vice-county Record.

Mosses

Atrichum undulatum (Hedw.) P.Beauv. + 12 (Boston Cemetery)

Bryum rubens Mitt. + 7 (College Wood)

Calliergonella cuspidata (Hedw.) Loeske (= *Calliergon cuspidatum* (Hedw.) Kindb.) + 12 (Boston Cemetery)

Didymodon ferrugineus (Schimp. ex Besch.) M.O.Hill (= *Barbula reflexa* (Brid.) Brid.) + 14 (Wilsford Cutting); last recorded from VC 53. in 1934 (see *British Bryological Society Report* 1934: 199); there is also an unconfirmed 1951 record from VC 54.

D. sinuosus (Mitt.) Delogne (= *Oxystegus sinuosus* (Mitt.) Hilpert) + 9 (Tetney Blow Wells), 12 (Boston Cemetery)

Eurhynchium pumilum (Wilson) Schimp. + 8 (Welton Vale, Elkington), 16 (Math & Elsea Woods, 2002, **VCR**)

Orthotrichum pulchellum Brunt. + 7 (Sotby Meadows)

Pseudocrossidium hornschuchianum (Schultz) R.H.Zander (= *Barbula hornschuchiana* Schultz) + 7 (Hardy Gang Wood)

Syntrichia ruralis (Hedw.) F.Weber & D.Mohr (= *Tortula ruralis* (Hedw.) P.Gaertn., B.Mey. & Scherb.) + 12 (Boston Cemetery)

Zygodon rupestris Schimp. ex Lor. (= *Z. baumgartneri* Malta) + 8 (Boswell Pit)

Liverworts

Frullania tamarisci (L.) Dumort. + 7 (Goslings Corner Wood); only the second recent record, the other being from Snipedales in 2001; there are also two 19th century records not supported by herbarium material

Porella platyphylla (L.) Pfeiff. + 10 (Tetford Hill)

Riccia fluitans L. + 10 (Kirkby Moor)

Lichens

Arthonia radiata (Pers.) Ach. + 15 (on *Liriodendron*, Belton Park, 2002, **VCR**)

Aspicilia radiosa (Hoffm.) Poelt & Leuckert + 15

Belonia nidarosiensis (Kindt) P.M.Jørg. & Vězda + 10,11,13

Buellia griseovirens (Turner & Borrer ex Sm.) Almb. + 15

Caloplaca flavocitrina (Nyl.) H.Olivier + 3, 4, 5, 6, 7, 8, 10, 11, 14, 15; overlooked in the past

C. obscurella (Lahm ex Körb.) Th.Fr. + 8 (on *Sambucus*, old church, Stenigot, 2002, **NCR**)

C. ruderum (Malbr.) J.R.Laundon + 10,12 (church wall, Benington, 2002, **VCR**),13,15

Chaenotheca chlorella (Ach.) Müll.Arg. + 15 (on *Fraxinus*, Holywell, 2002, **NCR**)

Clauzadea monticola (Ach.) Hafellner & Bellem. + 7

Collema tenax var. *ceranoides* (Borrer) Degel. + 8

Enterographa crassa (DC) Fée + 15 (on *Fraxinus*, Holywell, 2002, **NCR**)

Flavoparmelia soredians (Nyl.) Hale + 17 (on timber bridge, Gosberton Clough, 2002, **NCR**)

Haematomma ochroleucum var. *porphyrium* (Pers.) J.R.Laundon + 8,13

Hypogymnia tubulosa (Schaer.) Hav. + 17

Lecanora epanora (Ach.) Ach. + 7 (tombstone, Benniworth church, 2002, **NCR**)

L. intricata (Ach.) Ach. + 15

Lepraria lesdainii (Hue) R.C.Harris + 2,8

Melanelia exasperatula (Nyl.) Essl. + 17

M. subaurifera (Nyl.) Essl. + 17

Micarea lignaria (Ach.) Hedl. + 11,15

Ochrolechia androgyna (Hoffm.) Arnold + 15 (on *Fraxinus*, Holywell, 2002, **VCR**)

Opegrapha calcarea Turner ex Sm. + 5,6,13

O. niveoatra (Borrer) J.R.Laundon + 15

Physcia dubia (Hoffm.) Lettau + 8

Physconia enteroxantha (Nyl.) Poelt + 15

Placynthiella icmalea (Ach.) Coppins & P.James + 15

Polysporina simplex (Davies) Vězda + 10

Rinodina oleae Bagl. + 15

Schismatomma decolorans (Turner & Borrer ex Sm.) Clauzade & Vězda + 15

Solenopsora candicans (Dicks.) Steiner + 10

Thelidium incavatum Mudd + 7

Trapelia involuta (Taylor) Hertel + 10

T. placodioides Coppins & P.James + 5

Verrucaria macrostoma Dufour ex DC. + 12

V. viridula (Schrad.) Ach. + 12

Xanthoparmelia mougeotii (Schaer. ex D.Dietr.) Hale + 2,15

Xanthoria polycarpa (Hoffm.) Th.Fr. ex Rieber + 5

X. ucrainica S.Kondratyuk + 2,15

BOTANICAL REPORT - Irene Weston

The New Atlas of the British and Irish Flora was finally launched at Kew in September 2002. The Atlas Project – the result of strenuous recording since 1996 by the B.S.B.I. vice-county recorders and local members was led by David Pearman, Chris Preston and Trevor Dines from the Biological Records Centre at Monks Wood. The Atlas, a mighty tome, comes with a CD-ROM which allowsdetailed examination of the data. LNU members who contributed for Lincolnshire are acknowledged in the Atlas and I would like to thank everyone who contributed to the records for the two Lincolnshire vice counties. This year Paul Kirby has become B.S.B.I. Recorder for VC 54 and Malcolm Pool is sharing VC 53 with me as from now.

VC 53

Round-leaved sundew *Drosera rotundifolia* (plate 8) has been recorded by Helen Gregory from the Lincoln City Nature Reserve at Swanholme SK96 Div. 13. This was found after clearance of rhododendron scrub surrounding a peaty pool. It is the only recent record for South Lincs. having been recorded previously at Doddington, Thorpe and Stapleford where it had become extinct. Records in the Flora for SK96 are for 1851 and 1855 but these are first findings. As Swanholme is near Thorpe and Doddington maybe it will turn up again if clearance is done in suitable areas.

Small bur-reed *Sparganium natans*, has been found by Neil Harris at Baston Fen. Again thought to be extinct in both vice-counties this very considerable colony at Baston is remarkable. Previous records in Gibbons (1975) in VC53 are from Nocton and Dunsby.

Peter Haywood has recorded squinancywort *Asperula cynanchica* from TF06. It was recorded in this square in 1893. This limestone grassland species has become very rare in Lincolnshire and is currently known from just three sites. Only a small patch was found in TF06 this year at the site where it was first recorded in 2001 by PH.

Squinancywort *Asperula cynanchica* photo I.Weston

Round-leaved crane's-bill *Geranium rotundifolium* was found by Malcolm Pool in SK93 alongside a railway bank in North Parade, Grantham. This, a very extensive population, is only the second extant site in VC53. It was also found in greater numbers at Coleby in 2002 by I Weston.

Malcolm also recorded long-stalked crane's-bill

Geranium columbinum, uncommon on chalk and limestone, in TF00 on a dismantled railway bank and orange balsam *Impatiens capensis* in TF10 near the A16, Market Deeping. The latter, a native of North America, was first found in Lincolnshire in 1940 near Market Deeping.

Other notable records from Malcolm include cornflower *Centaurea cyanus* on disturbed ground in Elsea Wood, Bourne TF01 and 214 spikes of southern marsh-orchid *Dactylorhiza praetermissa* in rank vegetation on marshy ground between an arable field and a railway cutting at Great Gonerby in SK83.

Twenty-one spikes of violet helleborine *Epipactis purpurata* were recorded from Morkery Wood SK91 in 2002 by MP, PK, ZH, IW & VW.

VC 53 and 54

Bastard cabbage *Rapistrum rugosum* has been recorded in both vice-counties. It was found at two sites in TF02, in large quantities in fields of oil-seed rape in TF0827 near Callans Lane Wood, Kirkby Underwood by IW, PK, VW & ZH and in set-aside in TF0828 near Littleworth Barn by Malcolm Pool. At the latter site it was probably introduced in pheasant food. In VC54 it was recorded at Binbrook TF29 by Bill Meek This species is increasing in southern and central Britain and is an introduced casual now naturalised in southern England.

Marsh helleborine *Epipactis palustris*

photo I Weston

VC 54.

Annual beard-grass *Polypogon monspeliensis* was recorded on the north bank of the river at Cut End, Boston by Kay Heath. This was present in quantity in a classic habitat – i.e. damp brackish pasture, especially on the bare edges of pools, in maritime grassland. It was growing with creeping bent *Agrostis stolonifera* with which it can hybridise, but no hybrid plants were noted. Last found in 1991 by Annette Faulkner as a casual at Spalding, it has also been recorded at Cleethorpes 1963 by L. and B. Howitt, Lincoln in 1948 by F.T. and P. Baker, Elsham 1930 by W. S. Frith and Grimsby 1898 by A. Smith.

The Rotherham and Bradford Botanical Society, on a visit to the Lincolnshire Wildlife Trust's Messingham Reserve SE90, recorded two new orchids for the site, fragrant orchid *Gymnadenia conopsea* subsp. *densiflora* and marsh helleborine *Epipactis palustris.* Both are extremely rare in the county. This is the sole extant site for the former and only the second for the latter. Round-leaved wintergreen *Pyrola rotundifolia* subsp. *rotundifolia* flowered again this year on the reserve, its only Lincolnshire site, where it was first found in 1998 by F. Lammiman.

Only ever recorded in the county in VC54, slender sedge *Carex lasiocarpa* was found this year at Twigmoor SE90 by IW, PK, VW & ZH. A good flowering population in a damp hollow and boggy area – drier than in previous years. This is the first VC record for over 30 years, the previous record c.1966 was from Scotter at a Lincolnshire Naturalists' Union meeting. Earlier records are from Scotter in 1943, Laughton in 1878 and Scotton in 1820.

A new colony of sand leek *Allium scorodoprasum* was found by Vi Wilkin in SE 90 where it was present in quantity along 30m. of road verge in Sturton Lane, Scawby. Also in this hectad, IW, PK, VH & ZH recorded whorled water-milfoil *Myriophyllum verticillatum* and flat-sedge *Blysmus compressus* in Scawby Park.

Bloody crane's-bill *Geranium sanguineum* was found on the Messingham verge by George and Janet Heath in SE90.

After an absence of over 20 years flea sedge *Carex pulicaris* was re-found by Brian Hedley at Scotton in SK89. He also recorded this sedge in Little Scrubs Meadow TF17. These are the only extant sites for this species in the county. It was last seen at Twigmoor in 1986 by Vi Wilkin.

Keith Robertson sent records for both VC's – of note were c. 400 spikes of southern marsh-orchid *Dactylorhiza praetermissa* from Tattershall Pits TF 25 and large-flowered hemp-nettle *Galeopsis speciosa* (plate 9) from Ostler's Plantation TF26.

Least duckweed *Lemna minuta* was new this year for Burton Gravel Pits Nature Reserve, SK97. It was found by IW, PK, VW & ZH.

Changes noted in populations of rare species in 2002 include a decrease in the numbers of colonies of pillwort *Pilularia globulifera*. Early spring-sedge *Carex ericetorum* may have gone. It has not been seen for some years at either of its last known sites, both LWT Reserves. Chestnut flat sedge *Blysmus rufus* may be in decline and could only be found at one of its two known sites. Ribbon-leaved water-plantain *Alisma gramineum* was not recorded. It has not been seen in the wild since 1992 and there was an unsuccessful introduction in 1997. Despite intensive searches spring cinquefoil *Potentilla neumanniana*, has not been seen since 1983 by Irene Weston and must be considered extinct in the county.

Reference

GIBBONS, E.J. 1975. *The Flora of Lincolnshire*. Lincolnshire Naturalists' Union. Lincoln.

DRAGONFLIES AND DAMSELFLIES - John Redshaw

A damselfly which always seems to be scarce is the common emerald *Lestes sponsa*. However, this species appeared to have more success in 2002, with counts of 50+ at Welland Bank Pits Nature Reserve in TF10, 10+ at Messingham Sand Quarry Reserve in SE90, and 20 at Crowle Moors Reserve in SE71. Red-eyed damselfly *Erythromma najas* has continued to extend its range in the county with new sites at Barlings Gravel Pits in TF07, Riseholme Lake in SK97, Scawby Gull Ponds in SE90 and Carholme Road Golf Course, Lincoln in SK97. A new site for the very local hairy dragonfly *Brachytron pratense* was Messingham Eau at Susworth in SE80.

Banded demoiselles *Calopteryx splendens* had a very good year, with 100+ on the River Welland at Uffington in TF00, and other good counts at the Kirkby on Bain and Tattershall gravel pits in TF25/TF26 .

Observers reported that the emperor *Anax imperator* had a poor year. Maximum counts received were of four at Barlings Gravel Pits and five at Baston Fen Reserve in TF11. Two species that seldom get mentioned in the annual report are the common hawker *Aeshna juncea* and the black darter *Sympetrum danae*. As breeding species both are restricted to acidic habitats in the northwest of the county, with occasional sightings in the Lincoln and Woodhall Spa areas. Brian Hedley visited Crowle Moors on 4th August and recorded 30 common hawkers and thousands of black darters.

The only vagrant reported in 2002 was a sighting of a red-veined darter *Sympetrum fonscolombii* which flew in off the sea at Gibraltar Point NNR (TF55) in July.

SHIELDBUGS - Annette Binding

Thirteen of the eighteen species recorded in the county were found in 2002. Although there were no new finds, two of the more uncommon species were recorded during our surveys for Leeds University. A single specimen of *Sehirus luctuosus,* a ground dwelling bug associated with forget-me-not species *Myosotis sps,* was found at Whisby Nature Park by Allan Binding on 10th May. This is only the third Lincolnshire record, the other two being from Risby Warren in August 1987 (Kirby; 1988) and Gibralter Point NNR in June 1993. The second species of note found was *Rhacognathus punctatus* . Several specimens of this predatory bug were recorded on visits to Linwood Warren Reserve on 8th and 11th June. The bugs like wet heathland where they feed mainly on the larvae of the heather beetle *Lochmaea suturalis.* There were four previous records of this species in the county, two from Scotton Common in June and July 1988 and one each from Kirkby Moor Reserve in September 1997 and Crowle Moor in July 1999.

Reference

KIRBY, P. 1988. An Annotated List of the Heteroptera of Lincolnshire and South Humberside. *Transactions of the Lincolnshire Naturalists' Union.* **22** 41-70.

FLIES - Andy Godfrey & Jill Mears

A small number of records have been received for the past year. These have mostly been of the more common species, helping to consolidate and expand the Lincolnshire database of records, however two more interesting records were received.

The first, *Stratiomys potamida*, from Snakeholme Pit near Bardney, is a very striking black and yellow soldier-fly (plate 10) , only the fourth Lincs record. This species has recently become more widespread although still very infrequent. The adults are almost always found in close association to water, be that stream, pool or slow lowland rivers, these being the larval habitat.

The second species of interest was *Campiglossa absinthii*, a pretty picture-winged fly. The species is rare in Lincolnshire with only one site known, this being Gibraltar Point saltmarshes. The only previous record is from the 50 years ago. This is not due to lack of records or visits as a number of dipterists have spent considerable time combing the saltmarsh, hopefully it will not be another 50 years before it is seen again!

An article has been published on scuttle flies (Phoridae) associated with a large rothole in a mature oak at Hagnaby (Godfrey & Disney; 2002). The phorids were the most species-rich family sampled, with 475 specimens belonging to 19 species. Aspects of their ecology in relation to the rothole are discussed in the paper. This rot-hole has been the focus of prolonged study and another paper, by John Boorman and Andy Godfrey, is in preparation, adding a biting midge (Ceratopogonidae), new to the British Isles here and well-known old parkland in Herefordshire.

Richard Chadd sent a photograph by Roy Harvey of a small fly from Grasby near Barnetby which was apparently probing the tip of its abdomen around the wing base of an emerging southern hawker dragonfly *Aeshna cyanea* with a query as to what the behaviour represented. The options would appear to be either parasitism or commensalisms. Parasitism by biting midges of the genus *Forcipomyia paludis* has been recorded previously on dragonflies, usually with the mouthparts penetrating the wing veins (Stubbs & Chandler; 1978). Commensalism by minute flies belonging to the genus *Desmometopa* (Milichiidae) has been reported on *Cordulegaster boltonii* in Germany (Sternberg, K. 1993) although commensalism would seem unlikely on emerging dragonflies. Members of the Sarcopahgidae (most commonly known as flesh-flies) are also known to to be parasitic on other insects and the photograph probably most closely resembles a fly of this or a closely related family. Flies of the genus *Blaesoxipha* have been recorded mainly from grasshoppers in Britain but elsewhere in the world have been found parasitic on variety of other invertebrates. Unfortunately vouchers of the fly (or flies) were not retained and it is difficult to be certain which species were involved and what the behaviour represented. Thanks to Peter Chandler for suggestions as to the fly's identity.

Unknown fly on southern hawker dragonfly photo Roy Harvey

John Bratton requested information on the status of the ephydrid fly *Setacera aurata*, which he recorded from Winteringham in March 2003. Unfortunately, this family of flies is poorly recorded and information on status, distribution and ecology is very limited. It is unlikely however, to be a rare species, just very much under-recorded.

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GODFREY, A. and DISNEY, R.H.L., 2002 Scuttle Flies (Diptera, Phoridae) from a large rot-hole in an oak tree in England. *Diptersits' Digest.* **9**: 165-171.

STERNBERG, K. 1993. First record of commensal flies, *Desmometopa* sp., on a dragonfly *Cordulegaster boltonii* (Donovan) (Diptera: Milichiidae; Anisoptera: Cordulegasteridae) *Notul. Odonatol.* **4** (1): 9-12.

STUBBS, A.E. & CHANDLER, P. 1978. *A Dipterist's Handbook.* Amateur Entomologists' Society. London.

STUBBS, A. & DRAKE, M. 2001 *British Soldierflies and their Allies* British Entomological and Natural History Society

BEETLES - Roger Key

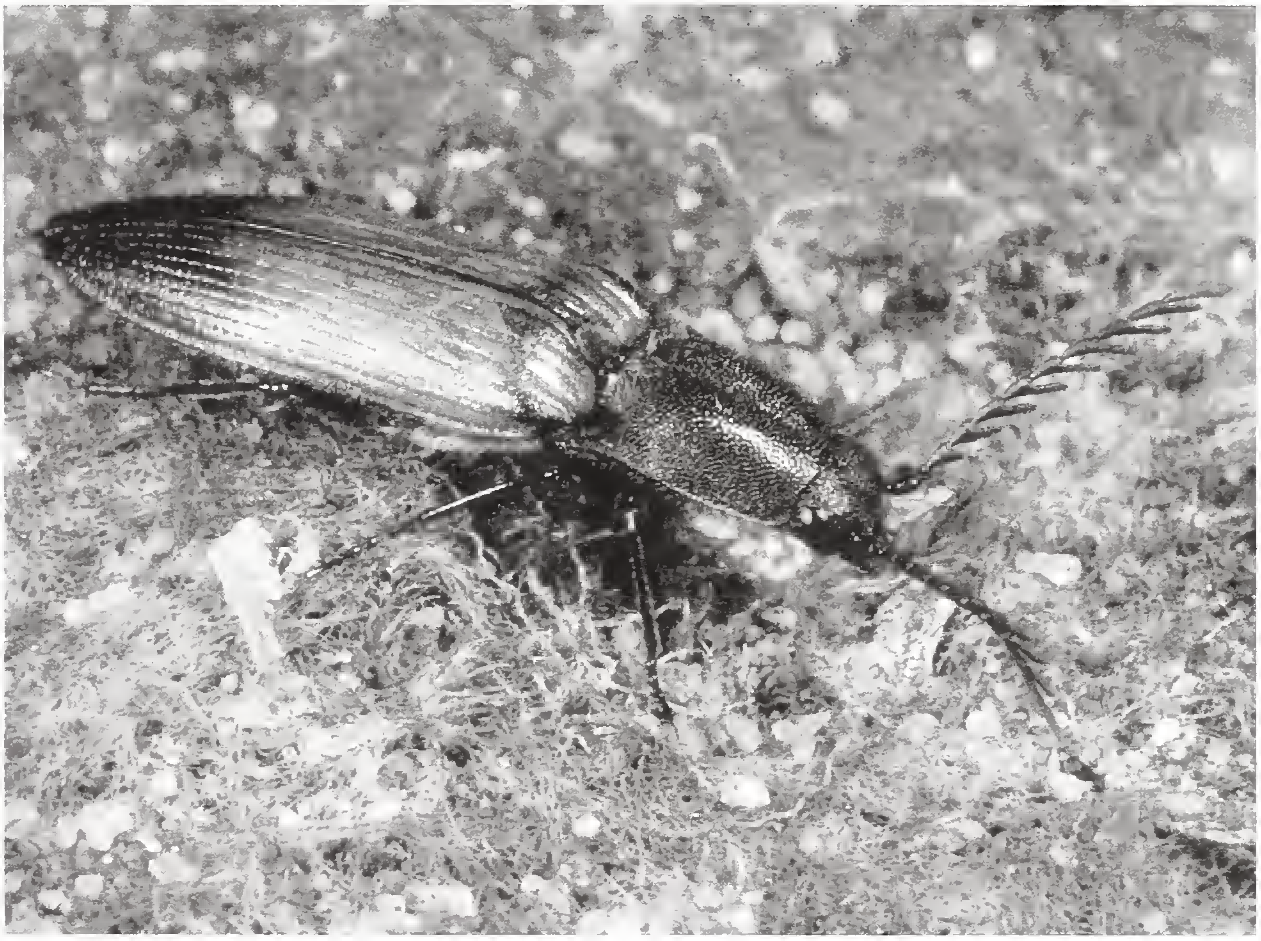
All statuses as per Hyman & Parsons (1992; 1994). This year we have had five species new to Lincolnshire, one of which was in a family also new to the county, Urodontidae, a group of primitive weevils. Annette & Allan Binding found *Bruchela rufipes* during a survey in July of waste ground at the University of Lincoln site at Brayford Pool, Lincoln with specimens found on dyer's greenweed, the usual foodplant of this species which only first colonised Britain in the early 1980s and is known to have been spreading since. A second species new to the county turned up on the same survey, an attractive bright metallic green weevil *Polydrusus splendidus* (technically Nationally Scarce A, but which has also recently spread and doesn't now warrant this status)(plate 11) in good numbers on young birch alongside the main railway line and on other birches dotted around the site. Also from the same site were the leaf beetle *Chrysolina hyperici* on St John's Wort, last seen in Lincolnshire at Cleethorpes in 1908 and *Omphalapion hookerorum,* a small weevil on mayweeds with only two prior records, Crowland in1993 and Haxey in1994. Allan & Annette also found the weevil *Sitona cambricus* new to the county at Messingham Sand Quarry Reserve on 16th August. As the name suggests, this is a largely western species and feeds on birds foot trefoil.

Colin Smith also found the tiny scydmaenid beetle *Eutheia scydmaenoides* (Nationally Scarce B) at Caenby on 24th April, while my own single addition to the county's fauna was another small weevil, *Taeniapion urticarium* on nettle, at Crowland Lido Wildlife Pond on 18th August.

Annette Binding made a number of other significant finds in the year: *Microplontus campestris* (Nationally Scarce B) a rather attractive black, brown and white weevil on ox-eye daisy at Cow Paddle, Lincoln 27th May. This is only the second recent record - otherwise my Crowland garden in 1988 and three 19th century records. The metallic purple and orange click beetle *Ctenicera cuprea* in College Wood in 1st June - there are 8 old records (latest 1907) but this the 4th recent record of this large, conspicuous northern and western species, usually of acid places, especially moorland. A small grey weevil which occurs at various plant roots in dry soil *Cneorhinus plumbeus* (Nationally Scarce B) at Middle Rasen Plantation on 13th June, the 5th recent with otherwise 4 very old records and one in the 1960s. *Phaleria cadaverina* a yellowish spotted darkling beetle typical of strandline litter, found among embryo dunes at Gibraltar Point NNR on 18th July. Colin Smith also found this species at Mogg's Eye on 1st June, these being the 4th and 5th records of the species.

Work on the hazel pot beetle *Cryptocephalus coryli* RDB1 has continued, and Annette & Allan made a very significant discovery by finding the species at Linwood Warren 8th June where it was last seen in 1949 and last found in the Market Rasen area 1965. We had thought the species to be extinct there, and its rediscovery justifies the caution necessary when considering re-establishments in areas where species have been thought to be extinct. We have now got the Linwood 'strain' in captivity derived from a wild female which was released after egg laying. The introduced colony of this species has also survived the year at Whisby Nature Park - adults were observed breeding May - so far a conservation success story.

Also at Whisby Kate Smithers found the pretty weevil on spurrey *Gronops lunatus* (Nationally Scarce B) in May, only the 5th county record.



Click beetle *Ctenicera cuprea*, usually a moorland species. photo RS Key

Colin Smith made a number of significant records during the year: the small rove beetle *Bledius diota* (RDBK - Insufficiently Known) at Donna Nook on 29th July, an east coast speciality and only the third recent record. *Pityophthorus lichtensteini* (RDB3 Rare) at Glentham on 16th July, a tiny bark beetle on conifers, the 2nd county record (possibly the first - as the earlier record of this difficult to identify species has never been confirmed); the metallic bronze-green saltmarsh ground beetle *Pogonus littoralis* (Nationally Scarce B) from Donna Nook on 29th July, the 11th county record and the furthest north in the UK (previously Gibraltar Point); another small ground beetle *Acupalpus consputus* (Nationally Scarce B) at Halton Holegate on 18th June and Willingham Forest on 17th July - there are only 3 previous sites, but it is common at Rauceby Warren. Colin found a couple of species at Caenby which are nationally quite common but which are uncommon or under-recorded in Lincolnshire, both being very tiny: *Clambus pubescens* and *Euplectus piceus* both of which are 3rd county records.

Annette and Colin Faulkner found two sites for the churchyard beetle *Blaps mucronata:* Great Ponton church on 24th January and Pickworth Church on 28th September, the 11th & 12th county records of this large black species that is living up to its common name. They also found a bright metallic blue, very hairy beetle *Korynetes caeruleus* (Nationally Scarce B) at Gedney Church

The churchyard beetle *Blaps mucronata* photo RS Key

on 13th May. This species is a predator of the deathwatch beetle *Xestobium rufovillosum* which they found there at same time. Available records would suggest that deathwatch beetle is scarce in Lincolnshire, though I would expect that house surveyors would probably know differently! A related species, similarly blue in colour, *Necrobia rufipes,* was found by Jon Webb at Risby Warren on 3rd July, the 6th county record but only 2nd recent one. It turned up in a dead rabbit, but is usually found indoors in stored products. At the same time he found the dune chafer *Anomala dubia* which Wayne Gillat also found at Clapgate Pits on 7th July - as its name suggests, it is typically a species of coastal dunes but is found inland in the East Anglian Breck and the Coversands heaths around Scunthorpe.

Jane Ostler turned up the dock leaf beetle *Gastrophysa viridula*, a brilliant metallic green species that can decimate common docks, at Colsterworth on 13th May, the 6th recent site. It seems to be having a bit of a renaissance in the county, having reappeared recently after 87 years absence in the county since it was widely recorded at the turn of the last century. Four good records came from an Entotax survey of the Wash by David Hemingway and Mike Denton the bright yellow sulphur beetle *Cteniopus sulphureus,* (plate 12) known mainly from the limestone and coversands in Lincolsnhire,*Pselactus spadix* (Nationally Scarce B) a weevil that bores into salt-water soaked timber, and the saltmarsh ground beetles *Pogonus luridipennis* (RDB3), an east coast speciality, and *Pogonus littoralis* (Nationally Scarce B).

Alan Lazenby turned up an unusual aggregation of hundreds of *Agonum marginatum,* a fairly common, attractive metallic green and yellow ground beetle, under stones and plants on the bank of a reservoir at Blankney Barff on 18th August, along with *Bembidion articulatum*. John Lamin found the jewel beetle *Agrilus laticornis* (Nationally Scarce B) at Steel's Ride in Grimsthorpe Park on 26th July, the 9th county record but only the 3rd recent one, and new to Grimsthorpe. It is incredible that yet more uncommon dead wood species continue to turn up at this very well known site.

John Bratton found the small weevil *Gymnetron veronicae* at West Halton 31st Dec, the 3rd county record and 2nd recent one, the rove beetles *Stenus melanops Stenus canaliculatus* on

12th June on the Humber Bank east of Whitton, the 4th and 5th county records, and *Stenus ossium* in ditch at Whitton Ness on 29th March, the 2nd county record, as well a golden green 'pot' beetle on hawkbits *Cryptocephalus aureolus* at Stanton's Pit 7th June, only the 2nd county record, the first being at Holywell in 1951.

My own other findings have been rather meagre. I turned up a couple of quite nice wetland species in a very unpromising site in Crowland, a litter-strewn, heavily flailed ditch across Snowdon Field, where I found the reed beetle *Donacia semicuprea* (8th recent record) and sedge feeding weevil *Thryogenes nereis* (4th recent record).

The 'pot' beetle *Cryptocephalus areolus* photo RS Key

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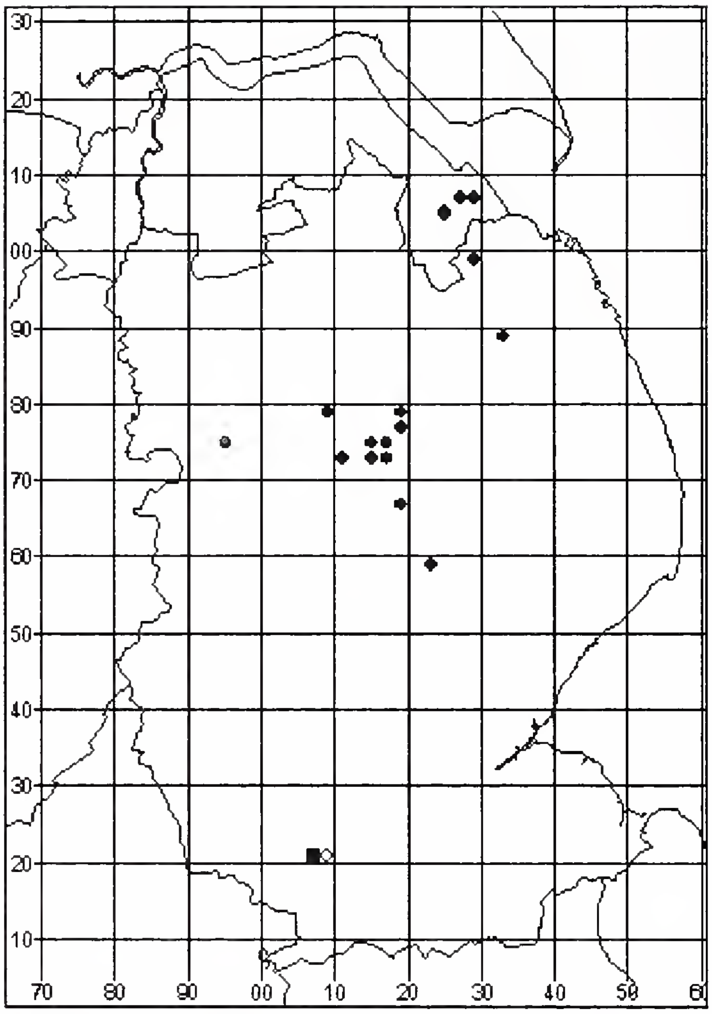
BUTTERFLIES - Allan Binding

Camberwell beauty at Washingborough photo Allan Binding

Many butterfly recorders in Lincolnshire reported that 2002 was a poor year for butterflies but, judging from the number of records I received (approx. 9000) this was not the case.

The most interesting records were of Camberwell beauty *Nymphalis antiopa* which was reported from five locations in the county. Records were received from Ian Birch at Riseholme,



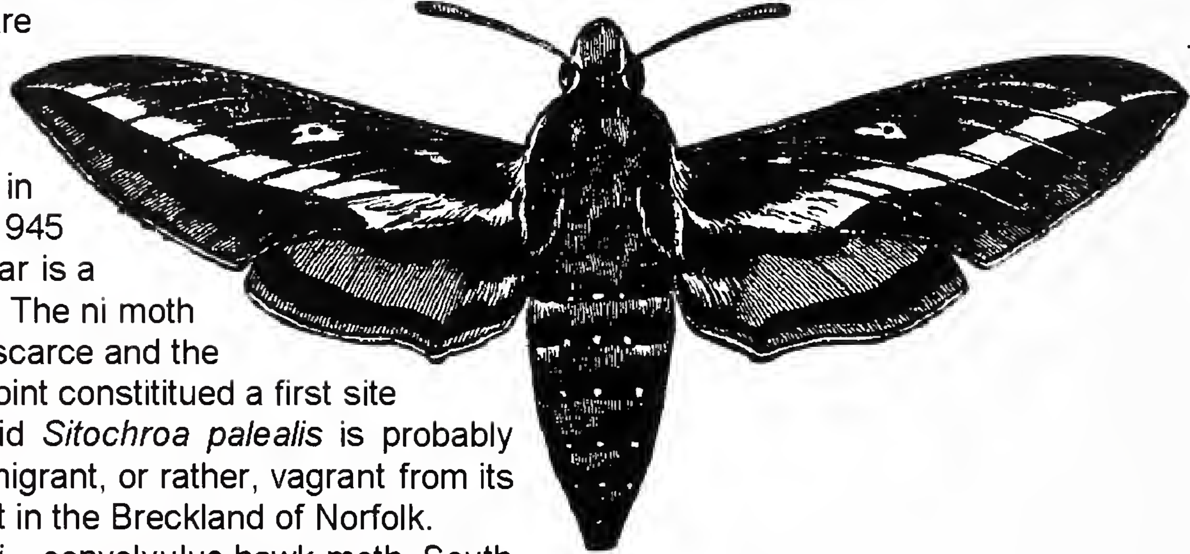
White letter hairstreak (white circles - 2000 only, black circles - 2002 only, black squares both years)

Brenda Edlington at Nettleham, Nicola Skelton at Washingborough, Ken Leighton in the Petwood Hotel Grounds, Woodhall Spa and Mr Timms in Scunthorpe. It was last recorded six years ago. Other migrant species seen in the county in 2002 were red admiral, painted lady and clouded yellow which was reported from 6 locations.

White-letter hairstreak *Strymonidia w-album* was, in recent years, thought to be dying out due to the killing of large elm trees by the Dutch elm disease, has had a very good year being seen in at least 15 locations throughout Lincolnshire. The distribution map showing tetrads they were recorded in during 2000 and 2002 is derived from the Butterfly Conservation Lincs Branch database. It has been seen in woodlands as far north as the Humber. Brown hairstreak *Thecla betulae* continues to do well in the Lime Woods. Green hairstreaks *Callophrys rubi* were found for the first time at Covenham Reservoir this year.

Small heath and small copper continued to be seen in low numbers as in recent previous years and green-veined whites were in lower numbers than other whites in 2002.

MOTHS - Phil Porter



Striped hawk

Among the migrants, the striped hawk-moth records are certainly the year's highlights as this species has not appeared in the county since 1945 so two in one year is a pleasant surprise. The ni moth is also extremely scarce and the one at Gibraltar Point constitituted a first site record. The pyralid *Sitochroa palealis* is probably a short distance migrant, or rather, vagrant from its recognised habitat in the Breckland of Norfolk.

Agrius convolvuli, convolvulus hawk-moth, South Cockerington, TF382885, 16th July J.Jaines & Muckton, TF3781, 29th August R.Labbett.

Callistige ni, ni moth, Gibraltar Point, 30th August , T.Sykes (first reserve record).

Macroglossum stellatarum, humming-bird hawk-moth, Coningsby, TF25, 29th July T.Ludlow, Bourne South Fen, TF1218, 12th September, J.Lamin & Hamilton Hill, TF130896, 17th May C.Smith.

Hyles galii, bedstraw hawk-moth, South Cockerington, TF382885, 09th June, J.Jaines.
Hyles lineata livornica, striped hawk-moth, South Cockerington, TF382885, 6th July, J.Jaines & North Somercotes, TF4398, 08th June, Dr P Waring.
Sitochroa palealis, Gibraltar Point, 24th & 29th July, T.Sykes.
Xylena vetusta, red sword-grass, South Cockerington, TF382885, 11th May, J.Jaines.

The macro-moth records appear somewhat sparse because, owing to a computer programme breakdown at Gibraltar Point, the records from this important site are not available. There are several coastal specialities which rarely if ever get picked up elsewhere. Dr Paul Waring has also recorded the tissue *Triphosa dubitata* but details are not available at the time of writing. The record of four-spotted *Tyta luctuosa* comprised a considerable number on a private site in the south of the county that must remain confidential. The bleached pug *Eupithecia expallidata* records are noteworthy because of the irregular nature of its appearances. The significant species recorded at Hougham are also extremely welcome. There were three records of the alder moth *Acronicta alni* which is recorded rather rarely.

Four-spotted moth

Xanthorhoe biriviata, balsam carpet, Hougham, SK8844, 17th July, N.Miller.
Eupithecia expallidata, bleached pug, Grimsby, TA2709, 24th July, V.Adams, Little London Wood,, TF137873, 13th June, C.Smith, Market Rasen, TF105892, 20th May, C.Smith, TF148739, 17th August, C.Smith, Louth, TF339863, 2002, R.Labbett.
Spilosoma urticae, water ermine, Hougham, SK8844, 23rd May, N.Miller.
Tyta luctuosa, four-spotted, confidential location, 2002, P.Waring.
Idaea muricata, purple-bordered gold, (plate 13) Hougham, SK8844, 17th July, N.Miller.

The rarer micromoth records were as follows;-
Blastobasis lignea, Market Rasen, Dear Street, TF105892, 04th August, C.Smith, & Glentham, TF012901, 14th August, C.Smith, New county records.
Coleophora virgaureae, Willingham Forest, Chapel Hill Farm, TF131893, 17th July, C.Smith, & Market Rasen, TF105892, 04th August, C.Smith, New county records.
Cydia funebrana, Scottlethorpe Quarry, TF045203, 28th June, J.Lamin, Not seen since 1947.
Endothenia pullana, College Wood, TF121754, 29th June, C.Smith, New county record.
Isophrictis striatella, Willingham Forest, Chapel Hill Farm, TF131893, 27th July, C.Smith, New county record.
Lampronia luzella, College Wood, TF121754, 19th May, C.Smith, Not since Mason's records.
Mompha lacteella, Temple Wood, TF055285, J. Lamin, New county record.
Mompha nodicolella, Willingham Forest, Chapel Hill Farm, TF131893, 17th July, C.Smith, New county record.
Oegoconia deauratella, College Wood, TF121754, 24th July, C.Smith, New county record.
Psoricoptera gibbosella, Chambers Plantation, TF148739, 17th August, C.Smith, New county record.
Retina resinella, Temple Wood, TF055285, 15th June, J.Lamin, New vice-county record.
Teleiodes alburnella, Aslackby, TF0830, 27th July, R.Johnson, New county record.

Colin Smith has been working with Rex Johnson on the backlog of unidentified moths that have built up over the years. With the publication of volume 4 of *'The Moths and Butterflies of Great Britain and Ireland'* it has been possible to identify quite a number of historical specimens and therefore add the records to the county list. There were twelve new county records and eight new vice county records.

Depressaria badiella, NCR, Several.
Depressaria weirella, NCR, Baumber Corner, 03/08/2000, C.Smith.
Metzneria aprilella, NCR, College Wood, 04/05/1998, R.Johnson.
Apodia bifractella, VC54, Laughton Common, 12/08/1999, R.Johnson.
Eulamprotes atrella, VC54, Camshaw's Plantation, 24/07/1997, C.Smith.
Eulamprotes unicolorella, NCR, Linwood Warren, 12/08/1997, C.Smith.
Monochroa lutulentella, NCR, Scotter, 13/08/95, R.Johnson.
Monochroa arundinetella, NCR, Messingham, 05/08/97, R.Johnson.
Teleodes paripunctella, NCR, Glentham, 12/08/97, C.Smith.
Bryotropha umbrosella, NCR, Several.
Bryotropha similis, VC54, Several.
Pexicopia malvella, NCR, Temple Wood, 08/07/1997, J Lamin.
Scrobipalpa atriplicella, NCR, Many.
Scrobipalpa acuminatella, VC54, Many.
Caryocolum proximum, VC54, Laughton Common, 12/08/1999, R.Johnson.
Caryocolum kroesmanniella, VC53, Temple Wood, 19/08/1997, R.Johnson.
Sophronia semicostella, VC54, Several.
Aproaerema anthyllidella, VC54, Glentham, 15/05/1997, C.Smith.
Batachedra pinicolella, VC54, Willingham Forest, 03/07/1999, C.Smith.
Mompha propinquella, NCR, Market Rasen, 24/07/2001, C.Smith.
Scythris limbella, NCR, Several.

SAWFLIES - Roger Key

In mid summer Dr David Sheppard was presented with an extraordinary group of sawfly larvae by Nita Atwood who found them at Dowsdale, right on the county boundary. These were of the sawfly *Stauronematus compressicornis* The larvae, on poplar, produce an extraordinary 'palisade' of dried saliva across the leaf (plate 14), which presumably acts to deter predators.

WASPS, ANTS and BEES - Michael Archer

My own activities during 2002 have been restricted to Rauceby Warren from which I have recorded the following interesting species: *Priocnemis gracilis* Haupt and *Andrena minutula* (Kirby). 97 species of aculeate wasps and bees have now been recorded from Rauceby Warren. Hornets *Vespa crabro* L. were recorded by K.D. Robertson at South Witham, Tattershall Pits, Grantham, Kirkby Pits and Revenby Reservoir. Geoff and Jan Culpitt from Bassingham, Lincoln recorded a carpenter bee *Xylocopa* species; a vagrant from mainland Europe. Unfortunately, the specimen was not retained so its species identity is unknown. Probably the species was *X. violacea* (L.), but less likely it could have been *X. valga* Gerstõcker.

SPIDERS - Annette Binding

No new species were added to the Lincolnshire list in 2002 but new sites were discovered for some of the county's more uncommon species. The most important of these was the discovery of *Evarcha arcuata* (Nationally Scarce B) at Kirkby Moor Reserve. This species of salticid or

Jumping spider *Evarcha arcuata* from Kirkby Moor photo RS Key

jumping spider was new to the county in 2001 when a single female was swept from heather at Epworth Turbary. The first specimen of *Evarcha arcuata* from Kirkby Moor was a female taken by myself, again from heather, on 7th June. In October Roger Key sent me a specimen from Kirkby Moor which was identified as a male *Evarcha arcuata*. This specimen had been taken at the reserve on 21st August. The species has a mostly southern distribution in Britain (Harvey et al; 2002) and seems to prefer damp heathlands and both specimens from Kirkby Moor were taken from wetter parts of the reserve.

One of the larger linyphid or money spiders *Drapetisca socialis* was found at three new sites in 2002, doubling its known distribution as there were only three previous records of the species. The new sites were Langholme Wood on 6th July, Messingham Sand Quarries on 16th August and Green Man Wood on 20th October. The spiders spin small webs approximately 6cm x 4cm almost flat against the bark of tree trunks. They particularly favour silver birch in fairly open woodlands. Since the spider's body is patterned with dark brown on a white background they are very difficult to spot.

Another new county site was found in 2002 for the uncommon crab spider *Diaea dorsata* when a single male was found on birch at Ostler's Plantation near Woodhall Spa on 1st June. There were seven previous records for this beautiful bright green and brown spider covering six sites.

One of the tiny linyphid spiders with very few previous records is *Ostearius melanopygius*. It is only 2mm – 2.5mm long and is probably the most widespread species in the world. It has been found on almost every continent and in a wide variety of habitats from woodlands in Europe to the tops of mountains in Africa, caves in Australia and remote tropical islands. It also occurs indoors and in ants' nests and my specimen was found under drying horse dung at Ostler's Plantation on 1st June. Unlike many of the tiny linyphids which are extremely difficult to identify, this one is much easier due to its distinctively coloured abdomen which is red with the tip black. It was last found in the county at Rimac in June 1993 and apart from the first known record for Lincoln in 1950, the other four records are all from coastal locations.

A species with only four previous records is *Cheiracanthium erraticum*. This is the commonest of the three species of *Cheiracanthium* found in Great Britain and like the other members of the *Clubionidae* they are nocturnal hunters spending the day in a silken retreat formed between leaves or grasses. The female also uses her retreat in which to lay her clutch of pink eggs. In 2002 we found a single female inside her retreat amongst grasses during survey work on the South Common in Lincoln on 26th June.

Tegenaria agrestis, a large spider related to the house spiders often found in the bath, was found in good numbers under stones and other debris on land alongside the railway line in Lincoln whilst surveying the area for Lincoln University prior to the commencement of construction work in July 2002 (Binding & Binding; 2002). It has been recorded from wasteground and alongside railway tracks in other parts of the country and seems to like this man-made habitat. It is rarely found indoors in this country which is just as well since in America where it is found indoors it is known as the 'Aggressive House Spider' due to its willingness to bite without provocation! This was only the third time the species had been recorded in Lincolnshire.

Also found at the University site were several specimens of *Drassodes*. There are three species in Britain, two of which have been recorded in Lincolnshire and both were present at the site. *Drassodes cupreus* and *Drassodes lapidosus* are nocturnal hunters which hide in silken retreats under stones and debris during the day. Although both species have been recorded a number of times in the county (eleven previous records for *Drassodes cupreus* and seventeen for *Drassodes lapidosus*) I mention them in this report because of their size. The female's body length can measure up to 18mm and only three other British species are larger. The females found at the University site averaged 14mm and, although they were large and somewhat fierce-looking, they appeared small when compared to a spider found in a house in North Lincoln in June by Mrs. Houlton. Roger Goy had put her in touch with us and over the phone she described a very large spider, over an inch long, fat and brown in colour which she had put into a jam jar. Due to its size she was afraid that it was foreign. My husband kindly went to collect it and large it certainly was! It turned out to be a female *Drassodes cupreus* and was quite the largest live spider I had ever seen. Its body measured 17mm and when it extended its legs to move it was well over 20mm. It was unusual for this spider to have been found inside a house so it had probably been brought in with something from outside. Both species of *Drassodes* tend to prefer dry places with lots of stones and debris under which to make their retreats so they are often found on heathland and scree slopes. Our subsequent recording of a good population of these spiders in Lincoln city indicate that, like *Tegenaria agrestis*, they too like this man-made habitat that provides them with everything they need.

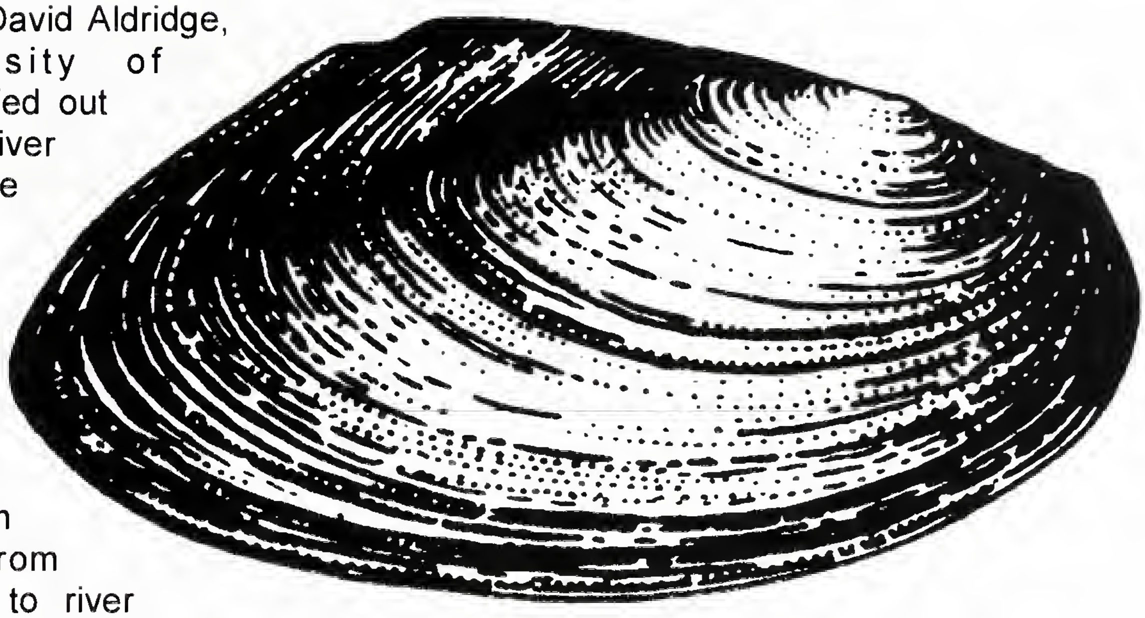
References

HARVEY, P.R., NELLIST,D.R. & TELFER,M.G.2002. *Provisional Atlas of British spiders. Volumes 1 and 2.* Biological Records Centre. Huntingdon.

BINDING, A.E. & BINDING, A. 2002. *Invertebrate and Botanical Survey of Waste Ground at Brayford Pool Campus, University of Lincoln.* Unpublished.

MOLLUSCS - John Redshaw

Although 2002 was a quiet year for general molluscan recording, two surveys by visiting conchologists were of significant importance.


Pseudanodonta complanata after Engelhardt; 1964

In February Dr David Aldridge, from University of Cambridge, carried out a survey in the River Witham for the Environment Agency. The survey was undertaken to locate any rare molluscs in the river for a distance of 3.5km downstream from Fiskerton, prior to river dredging works. Some 20 species of aquatic molluscs were found, including the compressed river mussel *Pseudanodonta complanata*. This extends the range of this species in the country, and the abundance found suggests that the Witham is nationally important for this UK BAP priority species.

The Witham orb mussel *Sphaerium solidum* (plate 15) was not found during this survey. In 2001 Ian Killeen camed out a survey for *Sphearium solidum* in Timberland Delph and in the adjacent R.Witham. Only two old valves were found. Dr. Martin Willing and David Holyoak were more successful in late October 2002, when a single live specimen, several recently dead articulated and old single valves were found in the Delph and the river. It is feared that deteriorating conditions may endanger this species, especially in the Delph which has become highly eutrophic. It is understood that *Sphaerium solidum* has now been found in the River Great Ouse, but details have not yet been published.

In June two new species were added to TF11 and Baston Fen nature reserve when the slugs *Arion distinctus* and *Arion silvaticus* were found under rotting logs. Meanwhile, at Scunthorpe Chris du Feu added the slugs *Tandonia sowerbyi* and *Limax maximus* to SE80, and at Sudbrooke Park, Alison Brownlow added *Lehmannia marginata* and *Arion subfuscus* to TF07.

Reference

ENGELHARDT, W. 1964. *The Young Specialist Looks at Pond Life*. Burke, London.
WILLING, M & HOLYOAK, D. in prep. 2004. report on *Sphaerium solidum*. *English Nature Research Reports* .

MAMMALS, REPTILES & AMPHIBIANS - Colin Faulkner

Water voles *Arvicola terrestris* were seen on the river Bain, the Pike drain, the canal at Horncastle, Skellingthorpe Fens, Leverton, Wyberton, and Whisby, Kirkby Moor and Baston Fen nature reserves. There were fewer reports of the other voles, most coming from the same site at Wildmore Fen. Of the other rodents, six records of wood mice *Apodemus sp.*, and three for the brown rat *Rattus norvegicus* and large numbers of grey squirrel *Sciurus carolensis* were seen around the county. Lagomorphs produced thirty five records of brown hares *Lepus europaeus* and thirty-one records of rabbits *Oryctolagus cuniculus*.

Of the insectivores by far the most common to be reported are hedgehogs, *Erinaceous europeus* with fifteen records. Shrews had few records with five common shrews *Sorex areneus* and three pygmy shrews *S. minutus.* Nine reports of mole *Talpa europea* were reported.

Of the carnivores badger *Meles meles* has only been seen dead on the sides of roads, there being seventeen reports for the year. Foxes *Vulpes vulpes,* on the other hand, were mostly seen alive, with only two specimens being found dead, with two identifications by tracks and one by smell. An otter *Lutra lutra* was recorded, identified by its tracks, on the Horncastle canal at the road bridge. Of the smaller carnivores twenty-two weasels *Mustela nivalis* were reported and seven stoats *M. erminea*, mostly seen alive. A single mink *M. vison* was recorded at Baston Fen.

Of the larger mammals four species of deer were recorded; four fallow deer *Dama dama*, four roe deer *Capreolus capreolus*, eight muntjac *Muntiacus reevesi* and one red deer *Cervus elaphus*, Few marine mammals were reported; porpoises *Phocoena phocoena* were seen at Gibraltar point and in the Wash near Boston and two reports of common seals *Phoca vitulina*, one between Wisbech and the Wash and the other at the Withham outfall.

Of the amphibians and reptiles, twelve reports of common frog *Rana temporaria* were given and seven of common toad *Bufo bufo* and two reports of natterjack *B. calamita* at Gibraltar Point. Two sites with smooth newts *Triturus vulgaris* have been seen and one of great crested newts *T. cristatus* was discovered in the reporter's own garden pond at Fenton.

BATS - Annette Faulkner

Another busy year for Lincolnshire's bat workers, even though a lot of routine survey work now goes to consultants. There are, however, limits on what information they can pass on to our records because of 'client confidentiality,' but some records do filter through from consultants, all adding to our knowledge of bats and their behaviour in the county.

The year always starts with hibernaculum counts in January and February and we are slowly adding to our list of sites that are regularly used by bats, splitting the surveys between groups of bat workers as more people obtain the necessary licences for doing this kinds of work.

Undoubtedly, the jewel in this particular crown has to be the two closely related disused railway tunnels in the northern half of the county, which have now been monitored for over 15 years. Well over a hundred bats, of five different species, hibernate there each year (and those are the ones we find!) and, in October, these two tunnels were scheduled as an SSSI by English Nature, (of only ten such sites nationally), and the furthest north by some distance. The co-ordination of all these surveys is down to LNU member Gary Steele, who has worked tirelessly over the years to make sure the tunnels are taken seriously by all concerned.

The species found in most of the sites are the four *Myotis* species present in the county - whiskered/Brandt's bat *M. mystacinus/brandtii*, Natterer's *M. nattereri* (frequently the dominant species) and Daubenton's *M. daubentoni*, as well as brown long-eared bat *Plecotus auritus.* However, in the south-west of the county, barbastelles *Barbastellus barbastella* have continued to be seen at the two sites where they have previously been recorded, with maxima of 3 and 2 respectively. Pipistrelles *Pipistrellus sp* have never been found in underground sites, but continue to turn up as casual records when found during building work and the like.

Outside the hibernation season, the big question of the year was "are there serotines *Eptesicus serotinus* in Lincolnshire? " We have two old unconfirmed records of large bats that "weren't noctules" *Nyctalus noctula*, but neither was ever checked by an expert. However, after several detector training sessions and, in our own case, watching serotines at close quarters in Holland, where they are common, we are becoming increasingly convinced that they are present in the county and probably widespread. Four years ago, a group of us saw and heard bats just north of Boston which we suspected may have been serotines from their behaviour and echolocation. This year we have had what we were convinced were serotines at Baumber (2), over wet grassland near West Pinchbeck (3), and a sighting from a birder at Grimsby with a good description of two large, low flying bats feeding around willows. However, we need either a roost or a body for serotines to be added to the Lincolnshire fauna. Any records of large, early flying bats will be gratefully received! They are not known to roost in trees, but fill the niche in house-dwelling bats between modern (pipistrelle) and old (brown long-eared and Natterer's) properties, preferring houses built around the turn of the 19th/20th centuries - or so we are told.

In the north of the county, one of our bat workers has been searching for noctule roosts and has located one in a tree at Scawby, along with many sightings, and a visitor to the Lincolnshire Bat Group stand at the Lincolnshire Show who had concerns about the security of a tree roost at Manby, near Louth, also turned out to have a noctule roost, with 26 bats being counted out at the beginning of July. It would therefore seem that noctules are doing rather better in the north of the county than elsewhere, highlighting the need to be especially careful with work on trees that have holes in them.

Survey work returned to normal after the restrictions last year because of the foot and mouth disease outbreak, both for the National Bat Monitoring Programme and National Bat Colony Survey and, locally, in our 5-yearly update of roost records. We started off with an excellent response to the latter this year, but the third week following receipt of the questionnaires coincided with the football World Cup and replies all but dried up!

Our main aim in 2003 will be to try to track down the summer roosts of the two colonies of barbastelles, and also to follow up a promising sighting record at a third site near Lincoln, where about six "'medium-sized, dark coloured bats", were reported seen flying out from under the loose bark of a dead oak tree as it was being felled in 2000.

Errata in last year's issue

A number of mistakes in last years issue of 'The Lincolnshire Naturalist' have been pointed out to me.
Page 168 Plate 12 - the stick-on insert has the date as 2110 which should read 2001
Page 190 "Meetings in 2001" - These meetings took place in Year 2000
Contents page on rear cover
    "Lincolnshire Natural History in 2000" - this should be 2001
    "Meetings in 2000" - this should also be 2001
    'Aspects of Lincolnshire botany to 2000 by Irene Weston on page 69,
    this was inadvertently copied from the previous year and should be deleted.

TRANSACTION OF THE LINCOLNSHIRE NATURALISTS' UNION

Officers of the Union in 2002

President	Neil Pike	**President Elect**	Mark Crick
General Secretary	Mark Crick	**Treasurer**	Ian McAlpine-Leny
Auditor	John Levine	**Membership Secretary**	vacant
Publicity Secretary	vacant	**Programme Secretaries**	Phil Porter
Sales secretary	Annette Binding	**Publications Editor**	Roger Key
	Allan Binding	**Records Secretary**	Neil Pike & Roger Key

Executive Committee Chris Manning, Colin Smith, Roy Howard, Richard Chadd and Kate Smithers.

External Representatives Roger Key (National Federation of Biological Recorders), Ken Rowland (Community Council & Swanholme Advisory Gp). Neil Pike (Countryside Stewardship), Irene Weston & Ruth Race (Museum Action Gp).

Section Recorders

Geology	Mr David Robinson	**Micro Moths**	Mr John Lamin
Bryophytes/Lichens	Prof. Mark Seaward		Mr Colin Smith
Fungi	Mr Ken Rowland	**Flies**	Mr Andrew Godfrey
Freshwater algae	Dr W. Brierley		& Mrs Jillian Mears
Higher plants	Mrs Irene Weston	**Beetles**	Dr Roger Key
Molluscs	Mr John Redshaw	**Sawflies**	Dr David Sheppard
Spiders	Mrs Annette Binding	**Ants, wasps & bees**	Dr Michael Archer
Isopods& Myriapods	Mr Neil Pike	**Plant galls**	Mr Graeme Clayton
Dragonflies	Mr John Redshaw	**F/W invertebrates**	Mr Richard Chadd
Grasshoppers etc	Mr Brian Redman	**Fish**	Mr Nick Bromidge
Shield bugs	Mrs Annette Binding		Mr Ian McAlpine-Leny
Butterflies	Mr Allan Binding	**Birds**	Mr J Mighell
Macro Moths	Mr Phil Porter	**Mammals & Herps**	Mr Roger Parsons
		Bats	Mrs Annette Faulkner

SECRETARY'S REPORT - Mark Crick

Contrary to the impression given in the previous edition of *The Lincolnshire Naturalist*, the negotiations on the final form of the Service Level Agreement with the Lincs Wildlife Trust have been ongoing during 2002. The Agreement covers membership administration, financial management and mailings, with the intention of allowing the Executive to spend more time on the further development of the LNU. As the Agreement only came into full operation in late 2002, the first annual review will be carried out later this year. It is anticipated that a new membership leaflet will be produced during 2003.

Our web page has been substantially updated by Steve Gray and now includes links for the Bulletin subscription and seasonal programmes. It will be further developed during 2003.

The Wildnews e-mail Bulletin, which reaches over 500 people and is kindly put together by Roger Parsons, is now branded as an LNU vehicle. The Executive Committee has agreed that *Communique* should become more closely linked with Wildnews plus other matters of likely general interest to LNU members as may arise through Committee meetings etc.

The Botany project is progressing well. Approval from the Esmee Fairbairn Trust to extend it into a fourth year is being awaited.

The development of Louth Museum by the Louth Naturalists, Antiquarian and Literary Society has secured c.£360,000 support from the Heritage Lottery Fund. In February 2003 the LNU Committee agreed to donate up to £2000 towards the securing of matching funds, to be used for display work and a permanent LNU presence in the museum.

Meetings – 2002

Sun 27th Jan	651st field meeting. Geomorphology at the extensions to Gibraltar Point.
Sat 23rd Feb	Recorders meeting and reports
Sat 16th Mar	AGM and presidential address by Annette Faulkner. "The Fens: flat, boring and a 'wildlife free zone'? Laying the myth to rest."
Sun 28th April	652nd field meeting. Boston Cemetery / Crematorium (TF 325454)
Sun 12th May	653rd field meeting. Benniworth Moor Farm, East Barkwith (TF192809)
Sat 25th May	654th field meeting. Tothill Manor Farm, Authorpe (TF419813)
Sun 16th June	655th field meeting. Duke's Covert & Copper Hill Verges (SK980424)
Sat 6th July	656th field meeting. Donna Nook (TF422998)
Sun 14th July	657th field meeting. Manor Farm, Mavis Enderby (TF363665)
Sun 18th August	(field meeting. The Shrubberies, Long Sutton (TF425234) (cancelled due to storms)
Sun 15th September	658th field meeting. Messingham Sand Quarry, Messingham (SE908033)
Sun 20th October	659th field meeting. Green Man Wood, nr Bracebridge Heath (TF017951)
Sat 16th November	"Mr Pye's Shells.The Pye Collection of marine shells and its present day context." by Dr Philip Pugh of Anglian University Polytechnic, Cambridge. (The collection was formerly housed in the Lincoln City Museum).
Sat 7th December	"Deer and Deer-Parks in Lincolnshire" by Chris Manning.

† OBITUARY - W. MARSON PEET - by Irene Weston

I first met my friends Marson and Kaye Peet when we came to Lincoinshire in 1960. Marson was then Honorary Treasurer of the Lincolnshire Trust for Nature Conservation and an eminent ornithologist. He recorded extensively at the Gibralter Point Nature Reserve with the accuracy and remarkable passion for numbers which was characeristic of his career as a bank manager.

In the 1960's and 1970's, Joan Gibbons, then BSBI recorder, and I met Marson many times on field meetings for the Lincolnshire Naturalist's Union and the Trust and learned of his love of plants. In l977 he produced a very comprehensive list of plants and collection of slides of the nature reserve at Gibraltar Point, later to become the basis of his Presidential Address to the Lincolnshire Naturalists' Union in 1986 and which was also printed as the guide to the plants of the National Nature Reserve.

By 1980 he had become passionately interested in plant hunting and in the county recording and his offer to help with records was much appreciated. The two VC's, 53 and 54, cover a large area and a basic system of master cards was set up for the county This was invaluable later on when it was used for other surveys. In 1985 he visited all of the Trust reserves and road verges and established new basic lists. He took a very active part in the Monitoring Scheme in 1987 and was dubbed Computer Pete by Tim Rich although we had no computer skills at that time. Marson could not tolerate any degree of error - even 0.2% was alien to his training. He had a passion for numbers and was most keen every year to update our square totals with any additions and the post 1980 lists were to prove most useful. He also recorded for the Scarce Plants survey and was looking forward to the completion of the Atlas. His input into the botanical recording in the county was legion and I am most grateful for all his support and friendship.

Marson had an engaging personality, an active wit and had a generous way with visitors to our field meetings and nature reserves. At Gibralter Point, for example, he would always promise both children and adults that he would introduce them to both Sam and Frank by the end of the day. All were mystified until *Samolus* was discovered. The very rare *Frankenia* at the end of the day was a bonus. His input into my Adult Education Classes was a joy to all and his escapades with his "Yellow Peril" car on the out-of-county field courses were a talking point for the less adventurous. He is greatly missed but very well remembered by his friends who I am sure will send much love and sympathy to Kaye and his family.

Contributing to “The Lincolnshire Naturalist”

We are constantly on the lookout for full length articles or short notes, even a few lines which can be useful space fillers, on any aspect of our natural history, current or historic. Consider a note in “The Lincolnshire Naturalist” for any new or significant observations.

Articles should be typed. It would help the editor tremendously if they could either be e-mailed or sent on CD or floppy disk with accompanying paper copy, in just about any word processor format (although don't let this put you off sending in an article) and in the format described here. Adding an ASCII and/or RTF text file in addition to the word-processed file will ensure that it can be incorporated directly. Most word processors can also output in ASCII and RTF. Drawings, colour or black & white photographs, colour transparencies or negatives (please include a print) can be included. Colour illustration may be rendered to black & white. Please give a caption. Illustrations will be returned and edited text resubmitted to the author for approval and proof-reading before publication.

Convention adopted for names - Latin names should be *italicised*, **not** (bracketed) nor underlined and should follow the English name (where applicable) with no separating comma. English names should start with lower case letters unless incorporating other names warranting capitalization (eg Brandt's bat).

References to journals and books should please be as below. Please note and use the capitalization and italic convention.
WOODRUFFE-PEACOCK, Rev E.A., 1900. The Lincolnshire Naturalists at Freiston. *The Naturalist*, **25**: 141-144.
DUDDINGTON, J. & JOHNSON, R. 1983. *The Butterflies and Larger Moths of Lincolnshire and South Humberside*. Lincolnshire Naturalists' Union. Lincoln. 299pp.

The final copy date is **31st March** of the year in which the Transactions are to be issued. Please contact the editors directly if there is difficulty in meeting this deadline. If in any doubt as to whether your observation merits a note or an article, or you have any other queries please do get in touch with the editor c/o Lincolnshire Naturalists' Union, Whisby Nature Park, Moor Lane,Thorpe-on-the-Hill, LN6 9BW to whom texts should be sent. A guidance note is available and is sent out to recorders. Otherwise, please attempt to imitate the format in this issue of the Lincolnshire Naturalist.

My last editorial

Roger Key

Another late issue, for which I apologise to the membership again - this time caused by some rather later than usual contributions of articles, with the added problem that our usual printer went out of business and we had to tender to find another at a late stage.

I’ve now completed my stint as editor after producing ten issues. During that decade we’ve seen a change of name and format and also the introduction, first of black and white and subsequently of colour photographs, including the cover, made possible by changes in electronic publishing. Hopefully further changes will come in the future, adding additional improvements to our century-old journal. We hope to increase the circulation of the journal in future, bringing down costs and promulgating the work of the Lincolnshire Naturalists’ Union naturalists to a wider audience.

A single replacement editor was never found and I’m to be replaced by an editorial panel, on which I’ll continue to serve but only in a scientific advisory capacity. Others will now assume the job of shoe-horning text into the 60-odd pages available, correcting baffling English, chasing illustrations, badgering contributors for copy and noticing additional errors only the day after the journal comes out. I wish them well - its great fun - for a while!

THE LINCOLNSHIRE NATURALIST

including
Transactions of the Lincolnshire Naturalists' Union
for 2002
Volume 25, Part 4, 2003

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Woolly Rhinoceros - painting by Helen Gamble